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Preparing for Conditions After the War

THE United States is to-day fulfilling her part in the great struggle for democracy, and yet if we would fulfill our own destiny in the years that lie ahead, it will be necessary for us to look beyond the contending armies, to look at the blue sky above the trenches, and ask ourselves, "After the war, what?" Having seen the vision of service, we must be careful not to let it fade. We must not feed on false optimism or false philosophy, or, ignoring stern facts, drop back into listlessness. The great problem of immediate importance is the winning of the war, and many trials and tribulations, much suffering and sacrifice must be endured before the war will be won. After that new conditions of life, society, trade and commerce will confront us. We must prepare now to meet them so as to be able to cope with them when they arise. Like the other nations in the combat, we shall be confronted with a colossal war debt, and if we are to face the future with equanimity, we must increase the national income by increasing the productivity of our industries. This will necessitate most cordial relations between capital and labor. Since the other nations will likewise endeavor to increase their productiveness and seek wider markets, our industries must be protected against dumping, and those which are unable to develop themselves by reason of undue foreign competition or other causes will need government assistance. Industries on which other and larger branches of national production depend must be promoted and safeguarded, and measures must be adopted to insure that the experience gained and the progress made by us during the war shall not be thrown away when new relations are established. The financial and economic strain will not be successfully met unless careful consideration is given to these matters in advance. One way of preparing for these after-the-war conditions is outlined in part in this issue.

Placing Emphasis on Home Financing

WHILE a great deal has been said and written about the advantages of selling securities of utilities to the people in the communities served, not nearly enough emphasis has been placed on this method of finding capital. Those who read figures giving the results of certain efforts along this line oftentimes fail to grasp the bigness of the thing. Many, for instance, have read that the Northern States Power Company raised more than $1,000,000 in one year by this method; but that sum by itself does not convey the real picture. When it is stated that $1,000,000 was one-fourth the total capital requirements of the company for that year, we get the proper perspective on the success of the plan. This record was established in a territory composed of several hundred communities; but in the larger cities the method has been equally successful. St. Louis people recently bought $1,500,000 of 7 per cent preferred stock of the Union Electric Light & Power Company in the short space of twenty days. The central station entered this campaign after the sale of the first Liberty loan and against the protest of brokers who said the thing could not be done. Nevertheless, the sales expense was less by far than it would have been if the capital had been secured through the regular channels.

The foregoing are merely typical instances of what has been done in two communities. Records of equal success have been made in California, in Maryland, in Oklahoma and in Ohio. In some cases the method was tried under the spur of necessity, in others it was a matter of choice. Successes are on record in many states; and they are successes in every sense of the word, for the effort succeeded not only in raising required capital but also in creating better public relations. It seems fitting, therefore, at this time, when capital is difficult to secure through regular channels, to place emphasis on these successes and to point out that there is an opportunity to do more home financing when Liberty loan and other governmental drives for money are not pressing.

Hydroelectric Heating Service

THE supply of heating service by hydroelectric systems is a possible field for preparedness work this year which should receive careful consideration. The shortage of coal which looms ahead in not a few sections of the country for the coming winter, far off as that season still appears, renders the extension of electric heating applications on systems where the supply of energy is derived from waterfalls a very important subject. Every pound of coal which can be saved by substitution means more fuel available for war and other vitally necessary service allied with military operations. It is not to be expected that the heating of buildings on a large scale by electricity will be carried out, but there is an immense field of service for anti-chill heating, so to speak, both in winter and in the fall and spring months.

If the fuel demand continues along the lines now apparent both in the anthracite and soft-coal fields,

many premises comfortably, even luxuriously heated last winter, will be subjected to a rigorous curtailment in the fall of this year. Householders will shut off certain rooms and live in more restricted quarters as regards warmth, and in a good many industrial and mercantile establishments closer control of heat will be insisted upon, accompanied often by actual stoppages of steam supply to departments not absolutely requiring such service.

Now there is an immense field in residential and commercial service where either high-intensity, short-hour or low-intensity, long-hour electric heating may prove of great value, and this is the time for companies prepared to supply energy for such service at low cost to get in touch with the manufacturers of electric radiators and other specialized heating devices for small spaces and make their plans for the extension of such service in time for the fall demand. The portability, cleanliness and simplicity of such equipment are strong points in its favor, and even if the energy is supplied at lighting rates there are many installations possible where short daily use would prove advantageous. For central stations supplying energy from coal-driven plants there are also many opportunities for usefulness in off-peak cooking and other special applications of an industrial character. A vigorous effort should be made this summer to capture a substantial amount of noon-hour electric cooking and heating business in down-town restaurants, hotels and clubs. The slump of the load curve between 12 m. and 2 p. m. in many cities where a big power load exists is literally a thorn in the flesh of efficiency, and every installation using electric heat during that valley helps to conserve coal at the point of use and also at the steam generating station. Hydroelectric plants are, of course, specially suited to the economic development of this kind of service.

Classifying Customers for Utility Convenience

THE work of progressive public service companies inclines one to the belief that it is virtually impossible to analyze too thoroughly their potential fields of service. Central stations may well take a leaf from the book of a large street-railway system which recently completed a card-index record of prominent individuals in its territory. The manager of this company believes that the people residing near his lines are the chief source of his revenue and hence are his most valuable asset. The company referred to can pick out within a few moments all the lawyers in the cities and towns in its territory, if it so desires. It can put in shape almost before one realizes it a complete list of school principals, municipal officials, members of committees in church and society organizations, leaders of women's clubs and persons falling under other classifications. Whenever something arises on the system which interests a particular class, or which interests the marked persons of a particular community, it is now a simple matter to draw out the names and addresses and circularize any group desired.

It costs a central station of good size a substantial sum to write a letter to all its customers, and often there is no need in a particular case to address 100 per cent of the list. Surely there would be something well worth while in a classified and up-to-date analyzed list which could be segregated for the purposes of selling different classes of appliances or for recommending certain improvements in specialized illumination. Such lists, it is true, are often prepared as occasion demands; but it is safe to say that more work and more effective work can be done where a thoroughly representative permanent list of classified customers exists.

Many central stations know very little about their customers in detail, barring group exceptions, so that much of the effectiveness of distinctive publicity and service extension work along profitable lines is lost. Each manager must decide how far he wishes to analyze his patronage; but unless we are greatly mistaken he can hardlly go too far in this direction in the interest of establishing a service of maximum value to the community in terms of the investment.

Electric Truck Service in War Time

IS IT not time to consider the electric truck seriously as a war measure of conservation? As things now look it is more than probable that there will be a considerable scarcity of gasoline during the next year. So much is needed for the truck service of the army and for auxiliary motor craft that the price is certain to rise notably even if there is not such an actual shortage as would justify the government in commandeering the major part of the supply. Steps have been taken to curtail the output of pleasure automobiles, but on the other hand the registrations show plainly that this year there will be more cars in operation than ever before. Under these circumstances it looks very much as if the electric truck would become desirable as an instrument of real conservation. It is quite certainly more economical than horse-drawn vehicles for a large part of our city service, and it is equally evident that under the fuel conditions of the next year or two it will be able to give the gasoline truck a very hard rub. To be sure, it calls on the central station for energy, but it calls for it normally at night, during the period of low load, where its added demand helps the load curve of the station and tends to economical production.

A clear line should here be drawn between electric vehicles as a whole and trucks. To make a thorough success of the electric pleasure care there needs to be an elaboration of charging stations covering the territory so as to make recharging convenient and easy. This would imply considerable investment which at present is perhaps not justified. On the other hand, a large increase in the electric truck service could be made without any considerable addition to the cost of charging stations and with very little increase in their number. The energy needed for driving the trucks constitutes a very desirable night load, taking coal, to be sure, but under circumstances which render its use economical. The work of central stations is now encompassed with government regulations. They are not at liberty to make extensions indefinitely with the hope of picking up business when so large an amount of their output is needed for work associated with the war. Their investment, however, would not have materially to be increased in order to handle the recharging of a considerable fleet of electric trucks belonging to various industries already customers of the central

station. It therefore would seem to be good policy to make an effort to encourage this kind of load, both to help out the load factor and to assist in the conservation of gasoline.

If the increase of trucks for city use in the next two or three years were chiefly in electric trucks, the gain all along the line would be very material. To the central station it would represent added business at a valuable point on the load line; to the user of the truck a convenient and economical method of distribution in city work, and to the government the release of a very large amount of petrol for military and naval uses. We are not advocating any sensational exploitation of electric trucks. They are quite able to take care of themselves at the figures for liquid fuel likely soon to be enforced. As a practical measure of economy in the distribution of goods the electric truck has already made an excellent reputation, and it will not take very much encouragement on the part of central-station operators to increase the use of these vehicles to a point where the saving will be very material. In theory the gasoline truck produces its power efficiently, in practice it is operated a large part of the time under very inefficient conditions; so that if one were looking merely for conservation of B.t.u., electric service would probably show on the right side of the balance sheet. In addition, there is the possibility of specially large and profitable uses of electric trucks in cities supplied from hydroelectric plants, in which there is generally a surplus of power at night that could be most efficiently used. Certainly the subject is one well worth looking into seriously and thoughtfully, with a view of seeing whether encouragement of this particular class of vehicles by the central stations will not have on the whole so good an economic effect as to warrant special effort.

The Summer Load of the Central Station

ONE of the things which worry the central-station manager who serves summer resorts is the problem of handling seasonal load with a fair prospect of remuneration. The exact character of the summer demand varies widely from place to place, ranging from the petty service of little cottages, peanut stands and frankfürter emporiums to the furnishing of complete electric service to half-million-dollar estates. The paper on the economic phases of summer load which is concluded in the current issue gives data from both these extremes and from intermediate points. That summer business adds materially and sometimes very largely to the earnings of the central stations admits of no dispute. That it is as profitable as all-the-year-round load at the same price nobody is inclined to argue. It results very commonly in a maximum capacity demand during the summer months, much greater than in any part of the off-season period, thereby establishing readiness-to-serve at a cost which considered by itself would be somewhat staggering.

The economic nature of the situation hinges chiefly on the steadiness of the load and the length of the season. As respects the first, the diversity factor in the load of a summer colony may often be rather a favorable one, particularly when service is extended to all sorts of purposes, from lighting shacks to furnishing considerable blocks of power to a roller coaster. Summer customers as a rule, too, are not very fussy about extreme precision in regulation and are glad to get light on any reasonable terms to avoid the use and trouble of lamps and candles. A summer resort full of big estates is a very different matter, for it represents usually a load which is not only of considerable magnitude but which persists through a longer season and to a certain extent all through the year. The smaller and less pretentious resorts are likely to have but a short season, very variable from year to year, and never with any material amount of load after the heat of summer is over. The two extremes of summer service must therefore be treated on somewhat different principles. The big country place requires the best of service and may in the aggregate yield as good a return on the investment as the town establishment of the same owner, which is connected for a period not much longer and often not so well equipped with electric service.

It is the small resort, particularly the cheaper sort, which offers the most troublesome problem. Outside construction must be cheap, but inside construction cannot be shaved down on account of fire risk. The total amount of service, except for places of amusement, is small, and the latter furnish load only over a very brief season. The main point of the situation is that this kind of summer load can only be handled profitably at a higher rate than the regular one, on account of the large fixed charges and the small individual services, which involve many meters if energy is metered and many moral hazards if it is not. It is fortunate that the state commissions are taking a sensible and reasonable view of the situation and are making provision for remunerative summer rates. Granted these, such service can be made to pay a handsome addition to the yearly total. In certain territory a gain can be made by establishing interconnection with city plants and taking energy from the summer minimum of these to eke out the summer maximum at the resorts.

The Coming Issues

WHAT has the electrical industry done, particularly the central stations, toward winning the war? This is the theme that runs through the next issue—the N. E. L. A. "win-the-war" convention issue. The issue has been designed to be a supplement to the Atlantic City convention. None of the customary papers will be presented at the convention, but in the pages of the ELECTRICAL WORLD will be found a number of articles detailing the progress and developments of the past year in engineering and commercial activity. Due attention will be paid also to the problem of substituting female for male labor in the electrical manufacturing industry, and consideration will be given to the general background of central-station labor retention. Public relations broadly, with emphasis on the rate situation and the relation of utilities to the government's war program, will be other features of this issue. In addition, the problems affecting the present and future relations of manufacturer to central station will be touched upon. Economy in certain of its phases, as brought about by the war, will be the keynote of the engineering topics discussed.

Readjustment and Reconstruction Commission—I

A Suggestion to the President of the United States that He Appoint Qualified Men to Act Under His Authority and Direction in Preparing for After-War Problems

BY WINGROVE BATHON
Washington Representative ELECTRICAL WORLD

PEACE will come some day.

In the meanwhile American industry is doing nothing whatever in an organized way to prepare for the necessary readjustment.

On the other hand, England and her colonies, France, Italy, the Teutonic empires, the far Eastern countries and the Latin-American countries have begun to prepare for readjustment and reconstruction.

What must we do?

This article, and articles to follow, are for the purpose of suggesting the immediate creation of an agency to deal with the situation which will confront American industry at the end of the war—to gather facts now, to make plans now, to educate now, and to lead the industries of the country in the victories of peace when the right time comes.

Scope of the Proposed Commission

In detail, this is to suggest that a great service would be done the American people, and perhaps all of the free peoples of the world, in view of the resources of the United States, which must be drawn upon for a long period by the whole world after the war, if the President of the United States would appoint forthwith a commission, to be the President's own commission, to prepare for after-the-war problems—such a commission to be one not hampered by legislative enactments of Congress as to powers upon which it might be difficult for Congress to agree, not curbed and controlled by government appropriations or the fear of lack of them, but nevertheless certainly be established under the government sanction of an executive order and be assisted by the creation of an advisory council of government officials and possibly by the chairmen of some committees of Congress. Many executive officials and legislators are themselves too busy with the work of the war to lay aside their burdens of to-day to deal with after-the-war problems. Their assistants and associates should be used.

As to the main commission, it should include not only leaders in industry of all forms, taken from the ranks of private endeavor, but it should include leaders in labor, leaders in education and leaders in every other endeavor which enters into industrial effort. Such a commission should report only to the President and should take as much of its inspiration from his leadership as he may have time to spare from the conduct of the war with which he is charged by the Constitution. Such a commission might very well include in its appointees the following:

E. H. Gary, president of the American Iron and Steel Institute.

Samuel Gompers, president of the American Federation of Labor.

Arthur N. Talbot, president of the American Society of Civil Engineers.

C. P. Main, president of the American Society of Mechanical Engineers.

E. W. Rice, Jr., president of the American Institute of Electrical Engineers.

Sidney J. Jennings, president of the American Institute of Mining Engineers.

William H. Nichols, president of the American Chemical Society.

F. J. Tone, president of the American Electrochemical Society.

J. B. Doan, president of the American Machine Tool Builders' Association.

H. A. Wheeler, president of the Chamber of Commerce of the United States.

P. H. Gadsden, secretary of the American Electric Railway Association and resident Washington member of the Electric Railway War Board.

S. G. Williams, president of the Highway Industries Association.

In addition to these, the commission might also include the presidents of some of the various national organizations occupied with production and manufacture in the lumber, leather, rubber, textile, glass and other great industries of the country; also perhaps the president of the Farmers' Grange, the president of a great railroad, the president of a great shipping company, the president of a great educational institution, the president of a great insurance institution, and perhaps the president of the American Bar Association and the president of the American Medical Association, but, in any case, even if only to assure reports from abroad, the following representatives of American business in other countries:

A. V. Edwards, secretary of the American Commercial Club of Argentina, Buenos Aires.

Charles Lydecker, secretary of the American Chamber of Commerce for Brazil, Rio de Janeiro.

James R. Morse, secretary of the American Chamber of Commerce in China, Shanghai.

George M. Cassatt, secretary of the American Chamber of Commerce in England, London.

Charles H. Sherrill, secretary of the American Chamber of Commerce in Paris, France.

J. B. Stetson, Jr., secretary of the American Chamber of Commerce for Italy, Milan.

C. B. Parker, secretary of the American Chamber of Commerce for Mexico, Mexico City.

Preston M. Smith, secretary of the American Chamber of Commerce for Spain, Barcelona.

Theodore R. Yangco, secretary of the Chamber of Commerce of the Philippine Islands, Manila.

Changing from War to Peace Basis

In Washington the peace-time industries of the country are now being placed upon a war basis in a gradual manner. There has been time for a gradual "turning over" in the further organization of the war, which has been proceeding steadily month by month. But when the industries of the country have been fully placed upon a war-time basis, when supplies of labor, sources of material, reserves of capital and the markets for production have all been altered to meet war needs, it will be impossible to place industry back upon a peace basis gradually without danger of disaster second only in importance perhaps to actual loss of the war.

To meet that danger there must be organized preparation, such as is now proceeding in all of the countries at war except the United States, and these suggestions are being made to set forth a working plan as a nucleus for discussion and action.

The facts and the prospects for the future are being discussed and acted upon in almost every country of the world except this. Literally thousands of books, pamphlets and other writings have been produced in foreign countries to educate the people along these lines. More than two years ago there was created in Great Britain a reconstruction committee, which has since become an agency of the British government, the work now being in charge of Dr. Christopher Addison, a Minister in the British Cabinet without portfolio, and more than two hundred sub-committees plentifully supplied with experts are now engaged in solving British after-the-war problems.

The details of what has been done in Great Britain and the other countries previously mentioned, some suggestions as to what should be done toward readjustment in this country, and suggestions for the personnel of an advisory council, also to be created by executive order, under the chairmanship, perhaps, of Frank Lyon Polk, counselor for the Department of State and second in command of that department, will be offered in following articles. The personnel of a suggested advisory council will be dealt with in the next article as of prime importance because this personnel will include many of the detailed legislative and executive war organization contacts of the United States, which must be continued at work long after the war in all likelihood, in order—to use a homely phrase—to assist in "unscrambling the eggs."

There is need at once for a responsible high officer of the government, occupying a position such as that of the counselor of the State Department—and for him to have important associates—on such an advisory council, to answer fully, freely and day by day, now, the questions that a President's commission on readjustment and reconstruction might put to the government and to help solve the commission's problems.

After the war, because of accelerated thinking, we can secure the adoption of ideas that otherwise would not be acceptable or would be acceptable only after a very lengthy educational process. Therefore we have an opportunity now; for, in addition to such obvious readjustment and reconstruction work as the orderly reintroduction to industry of returned soldiers, the development of export trade and the use of our productive capacity for our industries expanded by war needs, we can use, now, the opportunity to secure the adoption by the people generally of economic theories for the husbanding of our exhaustible natural resources, such as coal and other fuels, iron, timber, etc., and we can also bring about now the adoption of policies which will insure the perpetual renewal of even some of the so-called inexhaustible natural resources, such as the soil and its products.

The tendency in any civilization after the struggle to subdue new lands is passed and life becomes less harsh is to seek ease and pleasure and not to put forth such great energy in production. The result is that the demand tends to become greater than the supply; that is, we consume more than we produce. This leads to social dissatisfaction and the moral influences which lead to decay.

INTERCONNECTION PLAN PROPOSED FOR RICHMOND

Fuel Administration Recommends that Virginia Railway & Power Company Buy Surplus of the Municipal Plant

Harry Flood Byrd, Virginia State Fuel Administrator, urges interconnection of the generating stations of the Virginia Railway & Power Company and the city of Richmond. His letter, addressed to the company and the administrative board of Richmond, says:

An investigation by electrical experts discloses that 4,000,000 kw.-hr. of power generated by water without cost by the electric plant owned by the city of Richmond is not being utilized and is being permitted to go to waste. The commercial sale of this power is prohibited under an existing city ordinance. The sale of this surplus power to the Virginia Railway & Power Company will enable the release of an estimated quantity of from 5000 to 6000 tons of coal annually. The city of Richmond will benefit by receiving the fair market prices of the power for which it is not now receiving any return.

The successful prosecution of the war will be advanced by the conservation of the coal saved—no small item—when even now vital war industries are being embarrassed by shortage of coal.

By an intercommunication of this character the city of Richmond will have a surplus of power which may perhaps be the deciding factor in the determination of the government to locate here war industries of an important nature. The shortage of power and coal in the New England States is now so acute that the government recognizes that the future war industries must be established where conditions are more favorable. As a war measure the connection as proposed is of such obvious advantage in making available surplus power now going to waste that the administration confidently expects the cordial co-operation of all parties affected.

The proposed arrangement will only last during the duration of the war. The individuality of each plant will not be disturbed. In view of the conditions as stated above, and following a conference with C. E. Stuart, chief of power and light division, United States Fuel Administration, Mr. Dickerson of the State Corporation Commission and representatives of the administrative board and the Virginia Railway & Power Company, I feel warranted in requesting that the interconnection be established at the earliest possible time.

To settle the financial details involved as between the city of Richmond and the Virginia Railway & Power Company, I suggest a board of arbitration, one member to be appointed by the city of Richmond, one by the Virginia Railway & Power Company, and these two to select the third. If desired, the administration will furnish an expert adviser. In this way, a fair price for the power sold by the city of Richmond to the Virginia Railway & Power Company could be arrived at.

The Fuel Administration will undertake to secure priority orders for the prompt shipment of the transformers and other equipment necessary to establish this connection.

The proposed interconnection in Richmond is earnestly desired by Dr. Garfield, who has been personally consulted and who is familiar with the situation.

Mr. Byrd has also made public a letter from Mr. Stuart pointing out the waste of city energy generated by water power, the seriousness of the fuel situation and the need for all the conservation possible. The government is attempting to centralize such plants, and Richmond is the first Southern city to be approached in the matter. Favorable action in Richmond would be extremely beneficial, Mr. Stuart believed, in having similar steps taken in other cities.

Company officials have indicated readiness to enter into negotiations for purchasing the surplus product of the municipal plant.

Sudden Short Circuits of Alternators—II

Thorough and Critical Exposition of Electromagnetic Phenomena Attending Sudden Short Circuits of Alternators in the Light of Recent Experimental Results—Practical Methods of Calculating Characteristics

BY N. S. DIAMANT, RICE INSTITUTE, HOUSTON, TEX.

THE phenomena that take place when an alternator is short-circuited are such governing factors in designing and operating alternating-current generators, in selecting oil switches and in laying out bus and switching arrangements that every engineer having to do with the generation of power or the apparatus used should have a practical working knowledge of the factors which affect the short-circuit characteristics. Now that larger units are being built and bigger networks are being served the dangers from short circuits are becoming more serious than they ever were.

In the May 18 issue of the ELECTRICAL WORLD a discussion of this subject was started by the author, in which he analyzed the electromagnetic phenomena which take place, considered three-phase sudden short circuits, made a critical analysis of short-circuit equations and gave physical interpretations of sudden short-circuit phenomena. In this issue he concludes the subject by discussing practical methods of determining the different short-circuit constants, single-phase sudden short circuits and the effect of load on sudden short-circuit armature currents.

PRACTICAL METHODS OF DETERMINING THE DIFFERENT SHORT-CIRCUIT CONSTANTS

The damping factors α_f and α_a can be determined experimentally by taking oscillograms of the rise of direct current in the field and armature respectively with the machine running at full speed and the secondary dead short-circuited. This method was developed by the author, and so far as tested by him it has given satisfactory results and affords a very convenient and probably a fairly accurate way of determining L and λ. The extent of reliability of this method must, of course, be determined by further practical experience.

If sudden-short-circuit oscillograms are available, the following methods may be used to determine α_f and α_a:

(1) Draw the exponential envelopes F, F', F'', etc., and C, C', C'', etc., of the armature current as indicated in Figs. 5 and 6. Then[17]

$$\frac{FC - I_{ssc}}{F'C' - I_{ssc}} = \varepsilon^{\alpha_f \pi} \tag{4}$$

or, approximately,

$$\frac{FO + OC}{F'O' + O'C'} = \frac{FC}{F'C'} = \frac{F'C'}{F''C''} = \varepsilon^{\alpha_f \pi} \tag{5}$$

Similarly,

$$\frac{FO - OC}{F''O'' - O''C''} = \varepsilon^{2\alpha_a \pi} = \frac{OM}{O''M''} \tag{6}$$

or,

$$\frac{FO - OC}{F'O' - O'C'} = \frac{F'O' - O'C'}{F''O'' - O''C''} = \frac{OM}{O'M'} = \varepsilon^{\alpha_a \pi} \tag{7}$$

where M, M', M'', etc., bisect at every point the vertical lines FC, $F'C'$, $F''C''$, etc. (Figs. 5 and 6).

Applying this method of calculation to a 10,000-kva., 2400-volt, four-pole, 60-cycle alternator,[18] Table III was obtained, in which columns 1 and 2 were measured off directly from the sudden short-circuit oscillogram. Taking the mean of column 5, $\alpha_f = 0.0155$, and from the mean of column 6, $\alpha_a = 0.0565$. α_f for the first cycle, however, is about 0.0244. From the armature current given in Fig. 6, the mean value of $\varepsilon^{\alpha_f \pi} = 1.07$, whence $\alpha_f = 0.0215$, and $\varepsilon^{\alpha_f \pi} = 1.19$ for the first cycle, whence $\alpha_f = 0.0357$.

The peculiar fact that the attenuation factors and especially α_f are larger for the first cycle or two of the sudden short circuit was mentioned before in the first

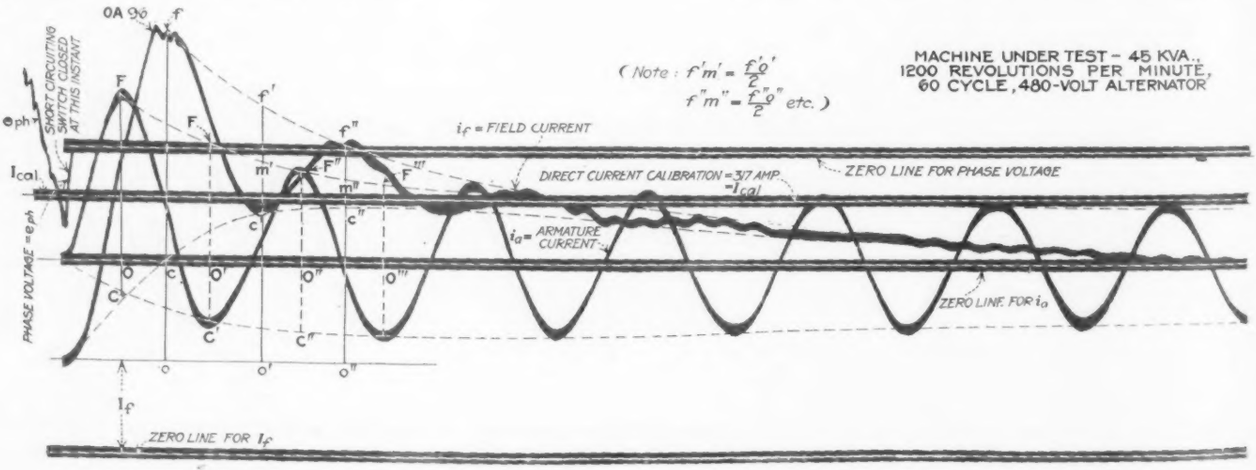

MACHINE UNDER TEST - 45 KVA., 1200 REVOLUTIONS PER MINUTE, 60 CYCLE, 480-VOLT ALTERNATOR
SHORT CIRCUITING SWITCH CLOSED AT THIS INSTANT
i_f = FIELD CURRENT
DIRECT CURRENT CALIBRATION = 3.7 AMP. = I_{cal}
ZERO LINE FOR PHASE VOLTAGE
i_a = ARMATURE CURRENT
ZERO LINE FOR i_a
ZERO LINE FOR I_f
PHASE VOLTAGE = e_{ph}
I_{cal}

FIG. 5—SUDDEN SHORT-CIRCUIT FIELD AND ARMATURE CURRENTS OF A PARTICULAR MACHINE UNDER NORMAL EXCITATION

[17] This method was first described by C. M. Davis in the *General Electric Review* for August, 1914, p. 813. It was independently derived and used by the writer, who first gave its mathematical proof (*loco cit.*, p. 2260). In a semi-graphical description of the method given recently by E. O. Shirley in the *General Electric Review* for February, 1917, p. 121, it is stated that this method of analysis is applicable only to a sudden short circuit at the terminals of the machine, in which case the resistance drop is negligible compared to the reactance drop. This statement is not correct in the opinion of the author. The methods described in the above section are general. The proof of (4) to (5) follows directly from (3) by writing expressions for F, F', F'', etc., and C, C', C'' and adding and subtracting corresponding ordinates.

[18] See *Transactions A. I. E. E.*, Vol. 31, "Operating Characteristics of Large Turbo-Alternators," by A. B. Field (Fig. 2).

installment of this article. The explanation of this phenomenon seems to be that at the beginning of the transient period the rate of change of flux is so high and the flux distribution so non-uniform that the effective resistance is higher owing to the larger eddy current losses, while in all probability λ is smaller owing to the greater leakage and saturation and the larger induced currents. Thus the increase of r and the decrease of λ would make $\alpha = r/\lambda$ larger for the first few cycles of the short circuit than for the subsequent cycles. Considering the fact that neither r nor λ is absolutely constant, about the only thing that can be done is to employ average values which will give satisfactory results in ordinary practical work. Knowing of the existence of such peculiarities, however, it is possible to introduce them into the calculations as "refinements" whenever accuracy makes it desirable or necessary.

TABLE III—ATTENUATION FACTORS CALCULATED FROM TRANSIENT ARMATURE CURRENT (FIG. 6)

Ordinates OF, $O'F'$, Etc.	Ordinates OC, $O'C'$, Etc.	Sum, $OF+OC$ Etc.	Difference, $OF-OC$ Etc.	Ratios of Column 3, $\varepsilon^{\alpha_f \pi}$	Ratios of Column 4. $\varepsilon^{\alpha_a \pi}$
1	2	3	4	5	6
14.4	2	16.4	12.2	1.08	1.22
12.6	2.6	15.2	10	1.05	1.21
11.38	3.1	14.5	8.25	1.05	1.18
10.4	3.4	13.8	7	1.04	1.18
9.6	3.7	13.5	5.9	.....	.....

TABLE IV—ATTENUATION FACTORS CALCULATED FROM TRANSIENT FIELD CURRENT (FIG. 7)

Ordinates, fo, $f'o$, Etc.	Ordinates, co, $c'o'$, Etc.	Sum: $fo+co$, Etc.	Difference: $fo-co$, Etc.	Ratios of Column 3, $\varepsilon^{\alpha_f \pi}$	Ratios of Column 4, $\varepsilon^{\alpha_a \pi}$
1	2	3	4	5	6
68.5	21.5	90	47.0	1.055	2.025
54	31.5	85.5	22.5	1.125	1.61
45	31	76	14	1.086	1.75
39	31	70	8	1.045	1.6
36	31	67	5	.....	.....

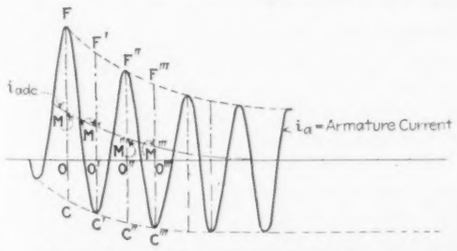
The armature and field attenuation factors can also be calculated from the transient field current by drawing the exponential envelopes f, f', f'', etc., and c, c', c'', etc., as indicated in Fig. 7. Then [19]

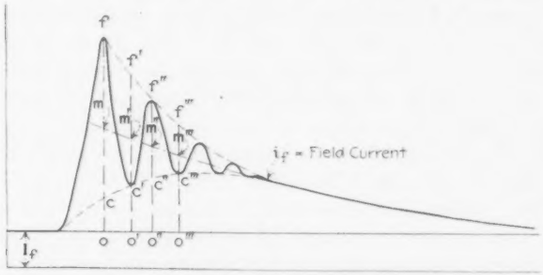
$$\frac{fo + co}{f'o' + c'o'} = \frac{f'o' + o'c'}{f''o'' + o''c''} = \varepsilon^{\alpha_f \pi} \qquad (8)$$

and

$$\frac{fo - co}{f'o' - c'o'} = \frac{f'o' - c'o'}{f''o'' - c''o''} = \varepsilon^{\alpha_a \pi} = \frac{mc}{m'c'}, \text{ etc.} \qquad (9)$$

This method of calculation is illustrated in Table IV,





FIGS. 6 AND 7—SHORT-CIRCUIT ARMATURE AND FIELD CURRENTS WITH ENVELOPES AND COMPONENTS

in which columns 1 and 2 were measured off directly from curve i_f of Fig. 7 and columns 5 and 6 were calculated by means of (8) and (9).

Taking the mean of column 5, $\varepsilon^{\alpha_f \pi} = 1.078$, whence $\alpha_f = 0.023$ and assuming $\varepsilon^{\alpha_f \pi} = 1.125$, then $\alpha_f = 0.0374$. The mean of column 6 gives $\varepsilon^{\alpha_a \pi} = 1.764$, whence $\alpha_a = 0.18$.

It may be noted that this method is independent of the time angle θ_1, at which the sudden short circuit may occur, while the method involving equations (3) and (4), which gives α_a, fails when θ_1 is nearly 90 deg., i. e., when the sudden short circuit occurs near the maximum point of the emf. wave, and the armature current is or becomes symmetrical so rapidly that $(oc - of)$, etc., $= 0$.

The determination of the attenuation factors is very important, as is beginning to be recognized, for the following reasons: (1) They permit the calculation, with fair approximation, of the maximum possible short-circuit current, which is important from the point of view of the stresses set up in the alternator; (2) they greatly affect the rate of decay of current and consequently the selection and rating of circuit breakers as was clearly brought out in a recent paper presented at the midwinter convention of the A. I. E. E.[20] In this connection it is of interest to consider Table V, which brings together some of the data given in the foregoing pages.

It may be observed from this table that the attenuation factors α_a and α_f are apparently limited to a fairly small range of values, for alternators ranging from 700 kva. to 15,000 kva. For example, α_a lies between 0.07 and 0.044, while α_f lies between 0.01 and about 0.03. The damping factor α_f of small salient pole alternators is, of course, about the same or smaller on account of the high inductance of the field spools, while α_a is larger than that of large turbo-alternators owing to the comparatively high resistance of the armature.

From the foregoing it would appear that one may be justified in attempting to give representative average sudden-short-circuit characteristic curves of decaying armature currents to cover "modern alternators of normal design." This is done in the paper just referred to, in which it is proposed, quite rationally, to base the selection of oil circuit breakers upon such

[19] The proof of this follows directly from equation (2) by writing the equations of the envelopes and adding and subtracting corresponding ordinates.

[20] "Rating and Selection of Oil Circuit Breakers," by Hewlett, Mahoney and Burnham, *Proceedings A. I. E. E.*, February, 1918. Also ELECTRICAL WORLD, February 23, 1918, p. 410.

average curves. However, considering the fact that Table IV is not so accurate and complete as might be desired, and further considering the large damping effect which will be caused by a comparatively small increase, up to a certain value, in α_a and α_f, it is well to exercise a little caution in the use of such average curves to apply to all modern alternators.

SINGLE-PHASE SUDDEN SHORT CIRCUITS

The principles involved in single-phase sudden short circuits are identical with those given for three-phase alternators, so that fundamental equations may be set up and expressions obtained for the field and armature currents in a similar manner. However, as the algebra involved in the solution of the equations is tedious and complicated, it will not be given here, but attention will be called to the following facts:

1. The double-frequency armature reaction superim-

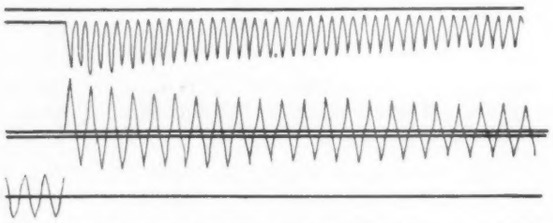


FIG. 8—SINGLE-PHASE SUDDEN SHORT CIRCUIT OF A 37.5-KW., 240-VOLT, 60-CYCLE ALTERNATOR AT NORMAL VOLTAGE AND SPEED

First wave—field current; second wave—armature current (note peaked appearance of the individual half waves as compared with those of Fig. 7, which, though taken on a different machine, are very similar in wave shape and smoothness to the three-phase sudden short-circuit current waves obtained with this alternator); third wave—armature voltage; second straight line from bottom—calibration curve (113 amp. direct current).

poses a double-frequency alternating current on the field current, which is made up of three components just like the three-phase sudden short circuit. This fourth double-frequency component, of course, persists during the sustained short circuit (Fig. 8).

2. The decaying direct current, I_{adc} (Fig. 4a), due to the change of flux in the armature, produces an alternating current of fundamental frequency in the field. This added to the double-frequency pulsation mentioned under (1) makes the alternate crests of the double-frequency component unequal, as clearly illustrated in Fig. 8. However, if the sudden short circuit happens to occur at $\theta_1 = 90$ deg.—i. e., at the maximum point of the emf. wave—then, as already explained, i_{adc} will be zero and thus the crests of the pulsating double-frequency current will be equal.

3. The armature current is more peaked, or in general the individual half-waves appear to deviate more from a sine wave, in case of a single sudden short circuit than in case of a three-phase sudden short circuit. This seems to be true more of some machines than others, and in case of wave shapes of armature current like the one illustrated in Fig. 8 it is fairly clear that the peaked appearance of the half-waves is due to the presence of a third harmonic. This third harmonic is no doubt caused by the double-frequency pulsation in the field. Theoretically, as already explained, the second, fourth, sixth, etc., even harmonics should be present in the field and the third, fifth, etc., odd harmonics in the armature. However, experience shows that in ordinary work the harmonics higher than the third are negligible.

4. According to the experience of the author and others, it appears that the methods of calculation outlined in the first part of this article are applicable to single-phase sudden short circuits despite the fact that the armature and field current equations are rather long and complex.[21]

[21]See Boucherot equations for single-phase short circuits.

EFFECT OF LOAD ON THE SUDDEN SHORT CIRCUIT ARMATURE CURRENT

According to the theory developed in the foregoing, it should be quite clear that the load carried by the machine before a sudden short circuit will affect the armature current only in so far as it affects the amount of flux existing in the armature and field before and after the sudden short circuit. Thus for a given terminal voltage the armature current will be larger for a heavy inductive load than for no load in the proportion in which the flux in the machine (not the field excitation) or the generated internal emf. is larger in one case than in the other. In short, the transient armature and field currents are affected only indirectly by the field excitation existing at the instant of the sudden short circuit and depend directly upon Q_{adc} and Q_{fdc} (Fig. 4), which in turn depend upon the *difference* of the flux before and after the sudden short circuit.

This theoretical conclusion has been corroborated experimentally by the writer and others, and it has furthermore been found that the increase of armature current due to load is relatively unimportant in small alternators having high resistance in the field and armature, but becomes more important in case of large turbo-alternators having comparatively low resistance in the field and armature. A little consideration will show that this is as might be expected, since, for a given change in flux, Q_{adc} and Q_{fdc} (Fig. 4) are inversely proportional to the resistances r_a and r_f respectively.

TABLE V—DATA ON ATTENUATION FACTORS

Description of Machine	Attenuation Factors of Field and Armature	Calculated from Mean of Several Successive Cycles
45 kva., six-pole, 1200-r.p.m., 480-volt	$\alpha_a = 0.154$ $\alpha_f = 0.0257$ $= 0.0093$	Mean of several oscillations. From first cycle From several successive cycles
700 kva.,* 4000-volt, 60-cycle	$\alpha_a = 0.0677$ $\alpha_f = 0.019$ $= 0.010$	From several successive cycles From first two cycles From several successive cycles
10,000-kva.,† 2400-volt, four-pole, 60-cycle	$\alpha_a = 0.0565$ $\alpha_f = 0.0244$ $= 0.0155$	From several successive cycles From first cycle From several successive cycles
15,000-kva.,‡ 25-cycle, 1500-r.p.m., 11,000-volt	$\alpha_a = 0.059$, phase 1 $= 0.0444$, phase 2 $\alpha_f = 0.0291$, phase 1 $= 0.0167$, phase 3	From several successive cycles From several successive cycles From several successive cycles From several successive cycles

*See footnote 12. †See footnote 18. ‡*Transactions A. I. E. E.*, Vol. 34, 1915, p. 2277 Fig. 4, "three-phase sudden short circuit at normal voltage."

Wages in Shipyards

The Shipbuilding Labor Adjustment Board has announced a schedule of minimum wages for labor in steel shipyards in the Great Lakes region. Here follow the wages, in cents per hour, for the electrical department: Electricians, first class, 70; electricians, second class, 65; wiremen, 55; joiners, 70; machinists, first class, 72½; helpers, 46.

Present Status of Brass Melting—I

Fundamental Principles Upon Which Success of Electric Melting Depends—Relative Merits of the Different Types of Furnaces That Are Now Upon the Market—The Central-Station Viewpoint

BY H. M. ST. JOHN

Commonwealth Edison Company, Chicago

IF ALL of the brass and bronze produced in the United States were to be melted in electric furnaces, the annual consumption of electrical energy for this purpose would be in the neighborhood of 200,000,000 kw.-hr. and the generating capacity required to supply the necessary power would be about 75,000 kw. There is little reason to expect the complete electrification of this industry, either now or in the future, but the expansion in this field which may reasonably be predicted will be sufficiently large to be interesting to the central-station companies.

The central station not only has an object in promoting the satisfactory progress of this development, but it has at stake interests which can be protected only by a constant oversight of such features of the development as directly concern itself. For example, the success of the central-station company depends upon the proper selection and correct use of the customer's equipment, since the customer's use of the company's service cannot possibly be satisfactory if its method of application is faulty. This may be a matter of minor importance in so far as it concerns the use of motors and other well-standardized equipment, but it is a matter of great importance when it involves new electrical devices or new processes which are not well understood and are, perhaps, entering the industrial world in a somewhat crude and undeveloped form.

Certain fundamental principles, upon which the success of electric brass melting directly depends, have hardly received, at least in public, the consideration which they deserve, and they will be discussed in this paper. In discussing them particular attention will be called to the bearing which they have upon electric furnace design and development.

In 1914 it was estimated by Gillett[1] that there were in the United States at least 3600 plants engaged to some extent in melting brass and bronze. It was further estimated that the value of the metal annually melted by these plants was in the neighborhood of $120,000,000, and that of this total the value of the metal lost beyond recovery during the melting operation was not less than $3,000,000. When one considers the extensive use of brass and bronze in warfare and the enormous industrial expansion along metallurgical lines which has taken place in this country since 1914, it should be evident that corresponding figures for the present time are much larger. Even if the total amount of metal melted annually were no greater now than then, the increase in market value of the metals concerned would of itself nearly double the value of the metal produced. The avoidance of waste in melting, which was even then considered important, therefore becomes particularly so at this time.

As has long been known, it is theoretically possible to eliminate much of this loss by the use of electric melting, particularly in the case of yellow brass and other alloys high in zinc. Most of the electric furnace development in the copper-alloy field has been carried out with this end in view. Metallurgically speaking, the problem is not a simple one and progress has been rather slow. Important advances have been made since 1914, however, and the present outlook is rather optimistic.

Two widely different types of electric furnace are now on the market and in commercial use for melting yellow brass. One is highly efficient but limited in its use to a portion of the field only; the other is less efficient but otherwise more widely applicable. At least one other type of furnace has been experimentally successful and is reported as about to enter the commercial field. Two or three additional types are being actively developed and give some promise of eventual success.

So far as yellow brass is concerned, it cannot be said that an entirely satisfactory furnace has yet been produced, but the field has been partly covered, and the prospects for further advancement in the art are good.

Previous to the war the use of electric furnaces for melting copper alloys did not seem feasible except in cases where a large metal saving helped to counterbalance the higher cost of electric heat. Under present

THE CENTRAL STATION'S OPPORTUNITY

The central-station industry has something to gain by the successful development and use of electric furnaces; it has something to lose by their failure. It is in a position to protect this interest if it cares to do so. The central-station company can, by virtue of a little effort, inform itself quite fully concerning the possibilities of electric furnace application within its territory. It can, in a similar way, make itself familiar with such requirements of its customers as have a bearing on electric furnace use. It will then have a wider knowledge than its customers of the electric furnace situation at large; it will have a more detailed knowledge of electric furnace possibilities and requirements within its territory than has the electric furnace salesman. By proper use of this knowledge and of such influence as it ought to possess in the industrial community which it serves the central-station company can promote well advised applications, prevent misapplications, point the way to correct use, discourage incorrect use, and insure profitable development, within its field of operations, of that newest of electric load builders, the electric furnace.

[1] H. W. Gillett, "Brass-Furnace Practice in the United States," *Bureau of Mines Bulletin No.* 73, p. 9 (1914).

conditions the high cost and poor quality of crucibles, the high cost and shortage of important metals, the high cost and scarcity of labor and the insistent demand for a high rate of production at any cost are factors which combine to make electric melting profitable in many cases where it would previously have been unprofitable. Whether electric furnace installations which owe their existence to these peculiar conditions will continue to show a profit when normal conditions once more prevail is still an open question. No one can say when conditions will again become normal, or, for that matter, what sort of conditions will be considered normal in the future. Much will depend upon the progress made in furnace design and in operating methods during the continued existence of the economic conditions which at present make possible the electric melting of copper alloys containing little or no zinc. The necessary progress can only be made by the combined efforts of such individuals and companies as are now profiting, and expect to profit in the future, from the increased use of electric furnaces.

ADVANTAGES OF ELECTRIC MELTING

Electric heat is expensive at best, and although it can be applied much more efficiently than heat derived from fuel, especially at high temperatures, it cannot profitably be employed except in cases where its use makes possible substantial savings of one kind or another to offset its added cost. The advantages which may naturally be expected to accrue from electric melting, as compared with melting in fuel-fired furnaces, are roughly as follows:

Metal Saving.—The saving of metal otherwise unavoidably lost is the principal economic advantage which the electric furnace is required to show in the melting of copper alloys, particularly in melting yellow brass. It has been completely demonstrated that such a saving can be made in the electric furnace by virtue of the fact that the furnace chamber can be tightly closed during the melting period and a neutral or reducing atmosphere maintained. As will be shown later on, it does not follow that every electric furnace is capable of a favorable performance in this respect. Conditions resulting from the war have greatly accentuated certain other advantages of electric furnace operation, but in more normal times no electric furnace can be expected to succeed in this field unless its use results in a saving of metal as compared with fuel-fired practice.

Improved Quality.—It has been found in most cases that a more uniform quality of metal can be produced in the electric furnace than in fuel-fired furnaces operating under similar conditions and that it is easier to produce an alloy of closely specified composition. In general, these advantages can be accepted as inherent in properly conducted electric furnace operation, resulting from the greatly reduced loss of volatile metals and from the elimination of contaminating combustion gases. So far as copper alloys are concerned, it is still undecided whether or not a higher quality of metal can be produced in the electric furnace as compared with the best of fuel-fired practice. It is beyond question, however, that high quality can be achieved more easily and with greater certainty. The successful electric furnace must be at least as satisfactory in these respects as the best fuel-fired furnace.

Exact Temperature Control.—The production of perfect castings, with the least possible number of defective pieces, depends in large degree upon the use of metal at a temperature which conforms closely with that known to be most favorable for the work in hand. The electric furnace lends itself readily to exact temperature control, which is an important advantage.

Increased Production.—In general, the speed of melting is greater in electric furnaces than in fuel-fired furnaces, because of the higher operating temperature and greater efficiency obtained. Furthermore, larger units can usually be employed than when fuel-fired furnaces are used.

Elimination of Crucible Cost.—The cost of crucibles is an item of considerable magnitude even in normal times. Under present conditions this cost is very high. Electric furnaces, which require no crucibles, therefore eliminate this expense. Large fuel-fired furnaces effect the same saving, but from a metallurgical point of view are seldom as satisfactory as fuel-fired crucible furnaces. Electric crucible furnaces deserve little consideration at the present time.

Incidental Savings.—The operation of large units results in an economy of floor space and labor, and increased production is attended by decreased overhead and interest charges per ton of metal produced.

Better Working Conditions.—More favorable conditions for the workmen, tending to increase their efficiency as well as their comfort, result when excessive heat, noise and fumes are eliminated. Properly selected and correctly operated electric furnaces are almost ideal in this respect. In installations where the reverse is true the trouble is due to the use of an unsuitable furnace, or to careless operation, or to both of these as contributing causes.

It should not be understood that these advantages necessarily follow from the use of any electric furnace which may happen to be selected. The furnace must be of suitable type, properly designed and correctly used. A misapplied electric furnace may prove worse in almost every respect than the fuel-fired furnace which it replaces.

First consideration must always be given to metallurgical requirements. Steel may be heated as rapidly as desired during the melting operation, provided that it is not exposed to contaminating elements during the process, but with copper alloys the case is quite otherwise. Copper is somewhat volatile and oxidizes much more readily than steel when in the molten state. Lead is also quite volatile, more so than copper, and oxidizes very easily. Zinc is exceedingly volatile at molten brass temperatures. All copper alloys must be treated carefully during the melting process in order that losses of metal by oxidation and volatilization may be kept at a minimum.

REQUIREMENTS OF ELECTRIC MELTING

Yellow brass for thin castings must be poured at a temperature not far below its boiling point in order that the metal may be sufficiently fluid. At this temperature zinc, which comprises 30 to 35 per cent of the alloy, has a tendency to vaporize rapidly. So long as the metal is contained in a tightly closed furnace chamber, which can easily be done in the electric furnace, this tendency is counterbalanced by the vapor pressure of the metal which has already been vaporized and with which the furnace atmosphere is saturated. When the

furnace is opened for pouring the metal or for any other purpose the vapor pressure is released and additional zinc will escape from the metal without restraint. If the heating has been perfectly uniform and all portions of the melt are at approximately the same temperature, the loss of zinc which ensues will constitute an unavoidable minimum. If the heating has not been uniform, some portions of the melt will be at a temperature higher than the desired pouring temperature, and such portions will lose zinc at a higher rate. If the lack of temperature uniformity is very great, the loss which occurs after the furnace is opened and during pouring will be decidedly excessive. In fact, some portions of the metal may be so seriously overheated during melting that the high vapor pressure formed within the furnace will force considerable quantities of zinc vapor through crevices in the furnace structure. In some cases it may be practically impossible to keep the furnace chamber closed, even to a reasonable degree. Under such conditions the zinc losses are likely to be quite as serious as in fuel-fired crucible furnaces, or even more so.

What is true of yellow brass poured at a temperature near its boiling point is also true, although in less degree, of yellow brass poured at lower temperatures and of other copper alloys. The lower the percentage of volatile metal the more easily the alloy will withstand uneven heating, but it can be accepted as an axiom of copper alloy melting that heat must be applied to the metal as uniformly as possible, whether the alloy under treatment is brass, bronze or some one of the less common alloys. If the application of heat in the furnace lacks uniformity to a serious degree, an excessive loss can only be prevented by some method of stirring the metal, and this stirring must be effected within the furnace, but without opening the furnace doors.

The metal as poured from the furnace must be uniform in composition, with its various constituent metals thoroughly well mixed and alloyed. In some cases a rigidly specified composition must be closely met. The finished casting or ingot must be of a quality at least as good, with respect to strength, freedom from cracks, blow-holes, etc., as that obtainable from fuel-fired crucible furnaces.

Since electric heat is more costly than that derived directly from fuel, it is important that the thermal efficiency of the electric furnace should be as high as can be obtained consistently with other requirements. A high thermal efficiency in electric melting, unless heat is generated in the metal itself, requires a high temperature heat source, placed as close as may be to the metal, under conditions which offer the least possible opposition to the flow of heat from the source to the metal. At the same time the walls of the furnace must be sufficiently thick and of high-heat-insulating quality in order that heat may not be dissipated uselessly from the outer walls.

In some types of furnaces these requirements are directly opposed to the metallurgical requirements already considered. In such cases thermal efficiency must be sacrificed to as great a degree as may be necessary in order to satisfy the metallurgical requirements. The highest efficiency consistent with good metallurgical results should be maintained; any higher efficiency is false economy. Of course, other things being equal, the more efficient type of furnace will meet with greater success.

The electric furnace, to reap the full benefit of its economic possibilities, must operate in large units and must not use crucibles. The higher its speed of melting the better, so long as speed is not detrimental to metallurgical results.

The electrical characteristics of the furnace must be such as to make it a desirable load for the central-station company or the factory power plant. Its power factor must not be abnormally low and its power fluctuations must not be so violent as to endanger transformers and other electrical equipment or to interfere with satisfactory service to other customers of the central-station company that may be connected with the same power line.

It hardly seems necessary to add that the successful electric furnace must be sturdy and reliable, quite as capable of performing its function, day in and day out, under regular operating conditions, as are the best types of fuel-fired furnaces. The furnace and its adjustments should be as simple as possible, although with a large electric furnace it is permissible, and nearly always desirable, to use a higher grade of operator than would be employed to tend fuel-fired crucible furnaces.

A great variety of electric furnace types have been proposed and tried out for melting brass. It is hardly an exaggeration to say that every known method of applying electric heat to a metal has been utilized by one or another of the various designs which have reached at least an advanced experimental stage. Some of these types have been eliminated as inherently unsuited for the purpose; some have been abandoned because of difficulties which may eventually be overcome by other investigators; others, partially successful, have apparently reached the height of their development; still others seem to possess greater possibilities of ultimate success than have yet been demonstrated.

This article will be concluded in a coming issue, where the different types of furnaces will be described.

ORGANIZING INSPECTION TO INSURE CLEAN COAL

Stringent Measures Are Taken by the Fuel Administration to Prevent the Shipment of Fuel Mixed with Dirt

To guard against the waste and serious loss resulting last winter from the shipments of dirty coal, which occupied car space and also seriously decreased industrial plant efficiencies, the Fuel Administration has organized a division of inspection, with C. M. Means as manager. A chief inspector has been appointed in each of twenty-one representative districts and where necessary assistant inspectors will be added. These inspectors will examine coal in the mines, also that dumped from mine to tipple, watch the picking tables, and again inspect the coal as it is loaded in cars for shipment.

Standards will be established for insuring proper preparation according to use, so that all coal shipped must be of the quality required for its particular purpose.

The New Westinghouse Research Building

Description of Laboratory Structure Specially Designed to Facilitate Working Out the Many Problems in Research That Constantly Arise—One of Seven Laboratories in the Company's Engineering Department

BY C. E. SKINNER AND R. W. E. MOORE

THE research work of the Westinghouse Electric & Manufacturing Company has always been carried on under the direction of the engineering department. In 1906 the research division was organized as one of the several divisions of the engineering department, and it now has under its control seven laboratories.

The work of the division includes activities which are not usually classed as research work in other organizations. For example, it has charge of the preparation of all specifications for the purchase of the materials used by the company, together with the experimental and development work leading up to the writing of these specifications. It includes a process section, which has technical control of all the various processes used by the company in the manufacture of its product. It has charge of the routine chemical and physical testing for all departments, including the inspection department. It has technical control of the various metallurgical processes, such as those involved in the brass foundry, copper mill, scrap-recovery plant, etc. Through the activity of its members on various standards and other committee work it comes into contact with numerous activities not strictly of research nature both within and without the organization.

Seven Laboratories Now Organized

The laboratories under the control of the division are the chemical laboratory, the physical testing laboratory, the process laboratory, the electrical laboratory, the molded-materials laboratory, the ceramic laboratory and the research laboratory. The latter is housed in what is commonly known as the "new research building." In accordance with the general organization plan of the engineering department of the company, the research division is divided into sections, each with a section head, reporting directly to the division engineer. The growing demands for more fundamental work made it desirable to provide a special building where advanced and new research problems could be better separated from the more insistent works problems. A location about a mile distant from the works was selected, partly on account of the crowded condition in the vicinity of the works, but more especially to secure a site relatively free from vibration, dirt and noise and which would afford a certain amount of isolation.

Architecturally, the building is plain but substantial. It is of reinforced concrete and brick, trimmed with white terra cotta. In its design special attention was given to the means of running pipe and wire services in such a way as to enable these services to be brought into any laboratory when needed, without disturbing any other part of the building.

The power house contains motor-generator sets for supplying single-phase, two-phase and three-phase current at 220 volts, and direct current at 250 volts (three-wire circuit). A motor-driven air compressor supplies compressesd air at 125 lb. pressure (8.75 kg. per sq. cm.) and a large motor-driven vacuum pump supplies the necessary house vacuum. A liquid air machine capable of supplying 1½ l. to 2 l. of liquid air per hour is also installed in the main power house. The storage battery is in a separate room in the basement of the power house and consists of a total of 218 cells, so divided that various groupings and combinations may be obtained.

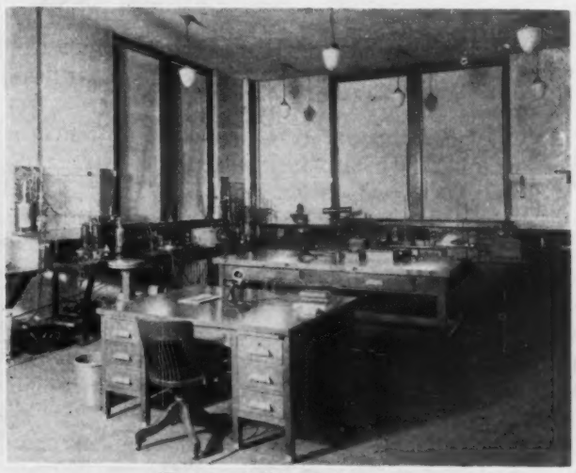
In one end of the basement is the furnace room with a battery of electric furnaces of various types, together with the necessary control for melting, annealing and various metallurgical processes. Stacks are provided at each end of the building, with openings in the basement, for experimental furnaces using fuel, usually natural gas. The woodworking and metal-working shop and storeroom are also in the basement. On the first and main floor are the main and private offices, the library and the conference room. The remainder of this floor is assigned to physical, electrical and magnetic research. The second floor, which is not entirely finished, will be given over to the same general class of work as the first floor. The third floor is devoted to chemical and electrochemical research, illumination laboratories and a glass-blowing room.

The manufacture of electrical machinery and apparatus as carried on by the Westinghouse Electric & Manufacturing Company is perhaps one of the most complicated of businesses, and consequently, research problems of a very large variety are constantly being brought to those in charge of its research work. Facilities for such research must, of necessity, include provision for many lines of work, such as magnetic insulation, metallographic metallurgy, chemistry, both organic and inorganic, together with combinations.

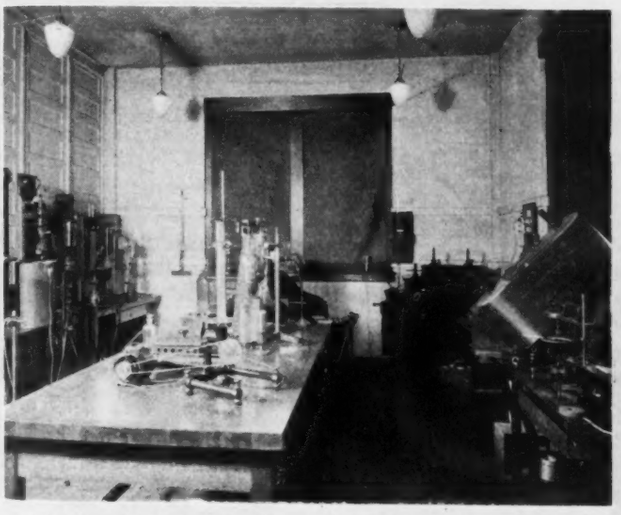
Present and Future Accomplishments

While this new laboratory has been occupied for only a comparatively short time, the work already accomplished gives much promise for the future. It is, of course, intended that the fundamental and advance work shall be carried out in this section of the research division and that the application work of the processes and products developed shall be carried out by the respective sections having more intimate contact with the works departments. Being under one management, men can be readily transferred from the more commercial sections to the research laboratory section or vice versa as the exigencies of the case demand. In this way, for example, a research man developing a new process for the control of some metallurgical operation can follow this up to the point of commercialization in the factory itself, still being a member of the research division. The scheme of organization above described insures the co-ordination of the various sections of the research division and the best possible co-operation of the research division with the other engineering divisions and the works departments.

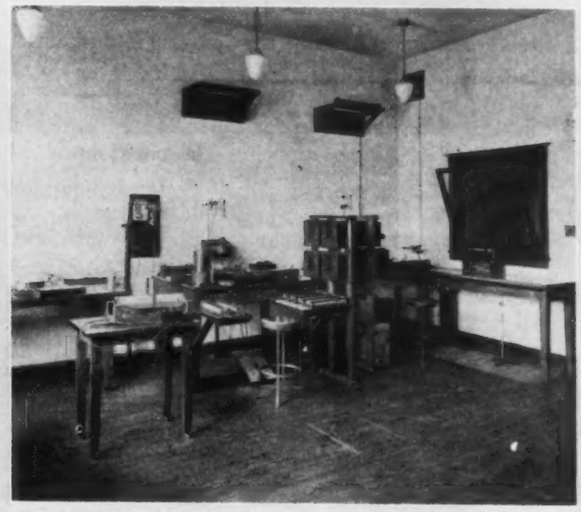
General View of Research Building, Showing Lincoln Highway in the Foreground.



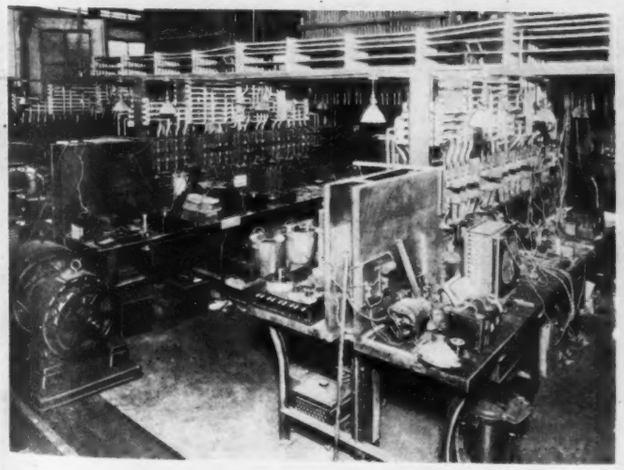
Typical Workroom Devoted to the Study of Liquid Dielectrics.



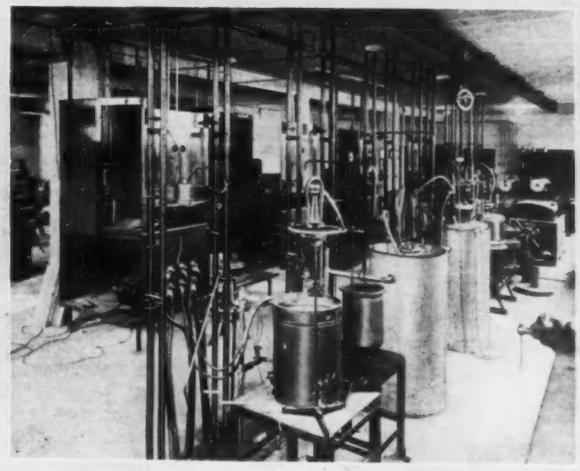
Typical Workroom Devoted to Metal-physics.



A Portion of the Magnetic Laboratory.



Part of the Research Facilities Devoted to Electrical Phenomena.



Battery of Electric Furnaces for Metallurgical Research.

NEW RESEARCH BUILDING OF WESTINGHOUSE COMPANY AND SOME OF ITS EQUIPMENT

Economic Aspects of Summer Load—II

Features of a Class of Service Which, When Properly Handled, Yields Profitable Revenue and Exerts Great Influence in the Popularization of Electricity—How Power Business Grows in the Hot-Weather Term

COMPARISONS of revenue earned by central stations from month to month with their changing peak loads and output variations throw considerable light upon the economic problem which companies face when supplying business of a higher seasonal character. Within a few months the Maine Public Utilities Commission had occasion to pass upon the equity of seasonal rates in the Old Orchard district, served by the York County Power Company, affiliated with the Cumberland County Power & Light Company of Portland.

At Old Orchard the York County company charged its year-round customers for energy, furnished under the same specifications as those governing its seasonal rate E, 9¼ cents per kilowatt-hour, with a minimum charge of $12 per year. The seasonal rate itself, applying to customers taking service for four months or less per year, between June 1 and Oct. 1, was 20 cents per kilowatt-hour for the first 100 kw.-hr. per month, 10 cents per kilowatt-hour for all in excess, and a minimum charge of $2 per month. The petitioners to the board claimed that the seasonal rate was too far in excess of the yearly rate to be equitable.

The accompanying diagram (Fig. 10) typifies the load conditions in the Old Orchard district. It is supplied from Biddeford over an 11,000-volt line, and were it not for the summer peak, the Old Orchard district load could be handled at 2300 volts. The variations of the input to the Old Orchard substation show that the peak load of the year came in August, the monthly input then being about 61,500 kw.-hr., compared with a December input of 10,200 kw.-hr. The total receipts from the Old Orchard district are about $25,000 per year, of which the out-of-season business (October to May inclusive) represents about $5,600. The number of customers varied from 943 in August to 285 in January. The peak load in the Old Orchard district (not including the entire 11,000-volt feeder from Biddeford) required a capacity of 440 kw. to be maintained during the summer, whereas the approximate capacity required in order to meet the winter demand was only 50 kw.

From the evidence it appears that the revenue from the seasonal business totaled $19,400 for four months, or an average of $4,850 per month; that 390 kw. more capacity had to be maintained to handle this business in summer, and that the summer business alone yielded $12.43 per kilowatt of plant capacity per month, but prorated over the entire year the extra capacity required for the summer service yielded only $4.15 per annum per kilowatt of plant capacity. The off-season revenue of $5,600, on the other hand, was gained in eight months from an active capacity of 50 kw.; in other words, this capacity earned $14 per kilowatt of capacity per month of off-season service, and two-thirds of this, or $9.34 per month, the year through. In this case, therefore, it would seem that the year-around business is easily more than twice as valuable from the plant investment standpoint as the summer business, or, putting it in another way, the summer business is probably less than half as desirable in relation to plant size as the year-around service. Nearly eight times the plant rating has to be carried through the year because of the summer business handled in four months or there-

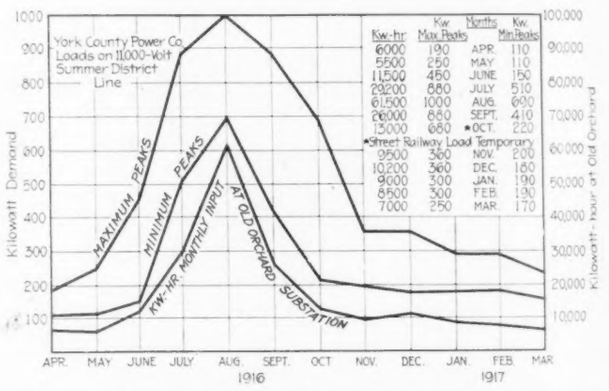


FIG. 10—LOAD CONDITIONS FOR TWELVE-MONTH PERIOD AT OLD ORCHARD BEACH, ME.

HOW POWER BUSINESS AT SHORE RESORT GROWS IN SUMMER SEASON

		Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1.	Kw.-hr. sold	216,013	171,899	164,352	239,402	174,820	240,355	245,105	251,555	239,901	185,072	197,120	227,337
2.	Kw.-hr. at bus	281,632	232,875	245,381	293,338	268,327	298,188	356,071	373,123	324,410	284,168	305,049	335,840
3.	Kw.-hr. power sold	11,889	9,915	14,553	27,816	30,044	56,581	58,492	57,478	43,600	15,763	19,514	18,431
4.	Kw.-hr. lighting sold	204,124	161,979	149,799	211,586	238,283	242,607	297,579	315,645	280,810	268,405	285,535	317,409
5.	Revenue, electricity	$17,103	$14,054	$12,963	$14,502	$14,534	$18,255	$18,891	$18,981	$18,801	$14,571	$15,888	$17,716
6.	Revenue, power	$521	$638	$680	$1,036	$1,600	$3,210	$3,060	$2,969	$2,160	$634	$793	$812
7.	Revenue, lighting	$16,582	$13,416	$12,283	$13,466	$12,934	$15,045	$15,831	$16,012	$16,641	$13,937	$15,095	$16,904
8.	Peak load, maximum kw	950	910	1,300	1,350	1,700	1,750	1,800	1,900	1,850	1,150	1,070	1,375
9.	Station rating, kw	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900
10.	Average revenue per kw.-hr. sold, cents, approximate	7.9	8.2	7.9	6.3	8.3	7.6	7.7	7.5	7.8	7.9	8	7.8

abouts that would be needed without this relatively costly service. The August output was about six and two-thirds times the highest non-seasonal output. The connected load of the Old Orchard district varied from 322 kw. in January to 1071 kw. in August.

In considering this case the commission recognized that if the cost per unit of service, owing to the distribution of capacity and organization expenses over a shorter period, is substantially greater than the cost per unit to twelve-months-per-year customers, it must affect the whole cost of the company's operations too seriously for it fairly to be absorbed in the charges to the year-around customers. The commission found this to be "clearly a case where the summer customers ought to bear the extra cost of serving them." The commission came to the conclusion that 20 cents was too high a charge for the use of the lesser amounts of energy during the seasonal period, in comparison with the 9¼ cent rate furnished year-around customers. A maximum rate of 15 cents was established, and it was estimated that this would reduce the revenue by about $6,073 in the Old Orchard, Kennebunkport and York Harbor districts, or by $1,677 in the Old Orchard district alone.

A comparison of the revenue from electricity sales by months in a New England central station serving a coastwise town which has a large year-round population and which contains one of the most popular shore resorts in that part of the country is shown in Fig. 11.

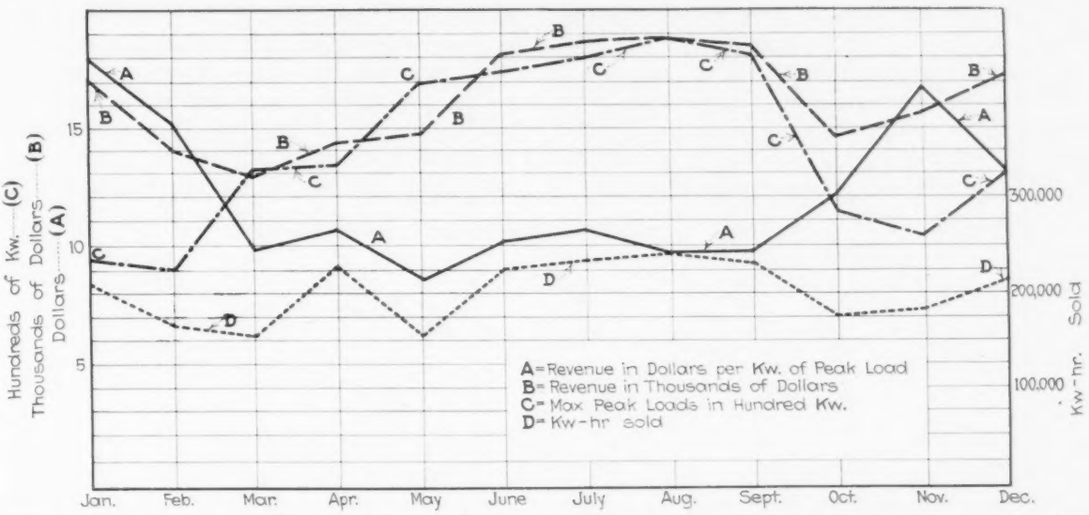

Hundreds of Kw. (C)
Thousands of Dollars (B)
Dollars (A)
Kw-hr. Sold
A=Revenue in Dollars per Kw. of Peak Load
B=Revenue in Thousands of Dollars
C=Max Peak Loads in Hundred Kw.
D=Kw-hr sold
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.

FIG. 11—COMPARISON OF CENTRAL-STATION MONTHLY REVENUE IN COASTWISE TOWN INCLUDING SHORE RESORT

Curves are also plotted showing the variations in peak loads on this plant by months and the revenue per kilowatt of peak load. The base data from which these curves are plotted are given, with other information of a comparative nature, in the table. In Fig. 12 are plotted the daily peak loads of this plant for an entire year. On this system the peak load occurred in August, and reached 1900 kw., the maximum low-month peak being about 910 kw. and occurring in February. The capacity of the plant was 2900 kw. throughout the year. It will be noted that the revenue per kilowatt of peak load per month fell from $18 in January to an average of about $10 during the summer months. The revenue per kilowatt-hour was also somewhat less in the summer

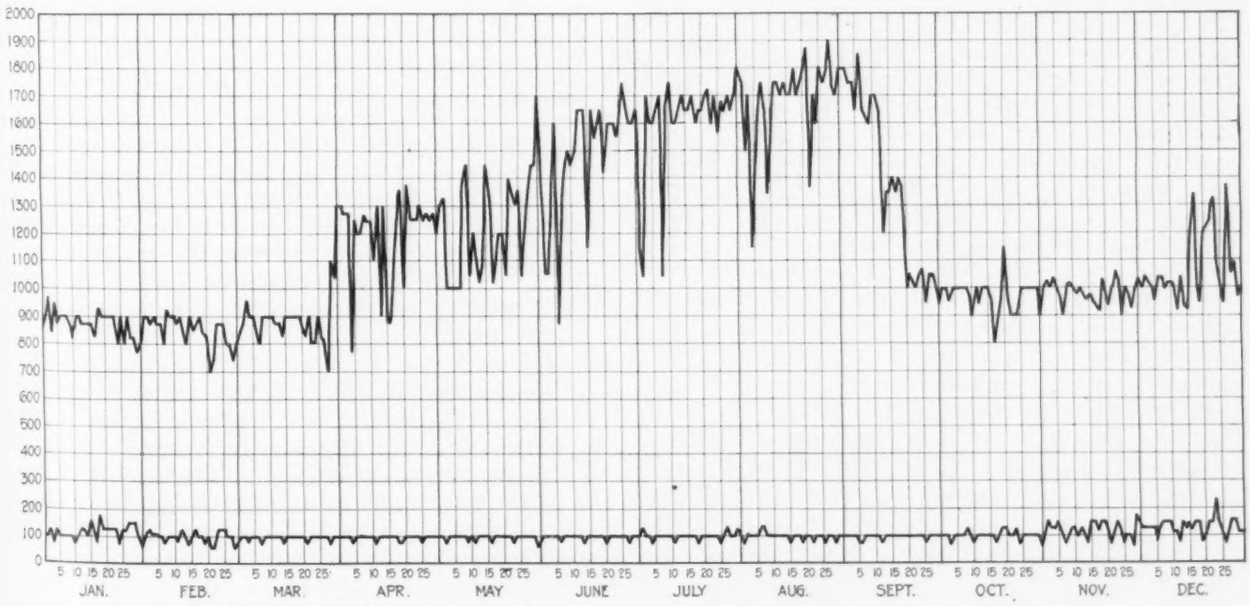


FIG. 12—ONE YEAR'S DAILY PEAK LOAD, IN KILOWATTS, OF PLANT REFERRED TO IN FIG. 11

season than at other times of the year. There is not so much difference in the case of this company as in some others between winter and summer rates, on account of the winter population, but the presence of a great amusement resort with a large amount of display lighting and power in the town increases the output materially in the summer. It will be noted that the kilowatt-hours sold from month to month varied in a general way in accord with curve of peak loads. The summer power business of concessionnaires at the shore resort is largely responsible for the great increase in power sales in the summer period, shown in the table, compared with the winter sales. The season is longer here than in many places at the shore, outline lighting of pavilions beginning even in April and extending well into the fall. The revenue shows no serious falling off until October. On account of the substantial year-round residential population which commutes to adjacent industrial cities, the winter revenue is larger than in many central stations serving shore resorts. Even with the stabilizing influence of this permanent population as a market for energy, however, the summer business involves a plant capacity of about 1000 kw. in excess of that needed for winter use.

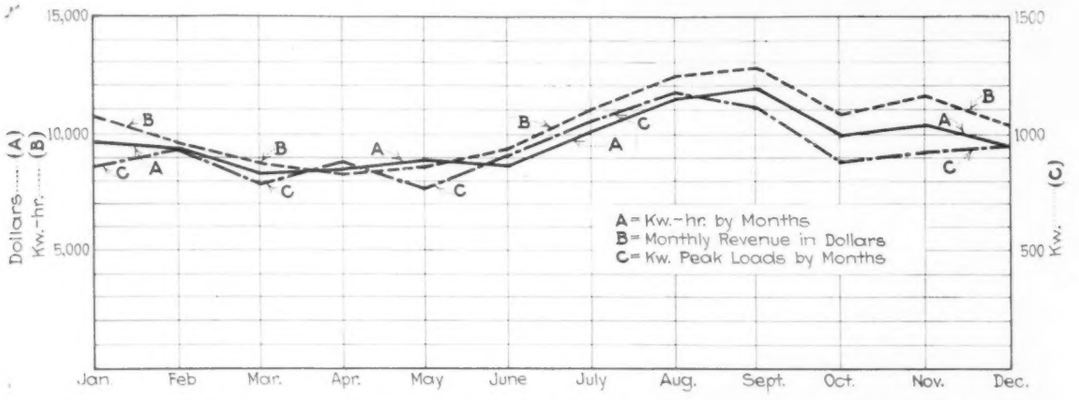


FIG. 13—CURVES OF MONTHLY PEAKS AND REVENUE FOR ATLANTIC COAST CENTRAL STATION

Fig. 13 shows the curves of monthly peaks and revenue for a central station serving a group of diversified communities along the Atlantic Coast. In this case the ratio of revenue to load changes very little from month to month. The yearly peak occurs in September. The summer user is charged a net rate of 16 cents per kilowatt-hour for the first 300 kw.-hr., and the all-year rate is 14 cents net. Seasonal customers pay a minimum charge of $6 per meter for the season, and yearly customers pay a minimum charge of $1 per month. In this case there is probably not great enough difference between the year-round and summer populations taking service to impose the marked difference in seasonal service cost which can be recognized in such a community as Old Orchard Beach, in Maine. The revenue per kilowatt peak was $12.80 in January and $11.40 in September.

Radio Inspectors Needed by Government

The United States Civil Service Commission announces an open competitive examination for radio inspectors at entrance salaries from $1,200 to $1,600. Applicants should apply for Form 1312 to the federal commission or to the local boards where such exist.

TEN YEARS' RECORD OF PUBLIC UTILITY EARNINGS

Gratifying Increase in Gross Earnings, Say Harris, Forbes & Company, Is Incomplete Showing Unless Net Earnings Are Given

For some years past, Harris, Forbes & Company, New York, have prepared annually a tabulation of the earnings of the public utility companies whose bonds or notes they handle. They have received reports for 1917 from 100 companies covering in their operations territory in thirty-nine states of the United States and in two provinces of Canada. These show a total average increase for the 100 companies of 10.3 per cent in gross earnings. This is a larger percentage of increase than the average during the past ten years, as will be seen from the following summary of gross earnings:

	P. C. of Inc.
60 companies, 1908 over 1907	7.3
61 companies, 1909 over 1908	11.3
66 companies, 1910 over 1909	12
70 companies, 1911 over 1910	9.3
73 companies, 1912 over 1911	8.6
83 companies, 1913 over 1912	7.4
84 companies, 1914 over 1913	2.9
86 companies, 1915 over 1914	2.8
90 companies, 1916 over 1915	10.4
100 companies, 1917 over 1916	10.3

Commenting on these results, the bankers say:

"It will be observed that the foregoing record shows uninterrupted annual increases in the aggregate gross earnings of these companies during the past ten years, the average annual increase being over 8 per cent. In normal times this tabulation alone might serve as an illustration of the stability of earnings of the well established public utilities. Under present conditions, however, the statement is incomplete without the facts as to net earnings. These companies, in common with practically all others, have been confronted during the past year with the problems of increasing costs of labor and material and higher taxes. It is therefore most gratifying to us that the aggregate net earnings of the 100 companies from which we have received reports show a falling off during 1917 as compared with 1916 of less than 2.8 per cent. Furthermore, the aggregate 1917 net earnings amounted to over two and three-quarters times the aggregate annual bond interest charges of these companies. We feel sure that this showing of earnings under adverse conditions is one of the most dependable indications of the desirability of public utility bonds for investment when selected with care."

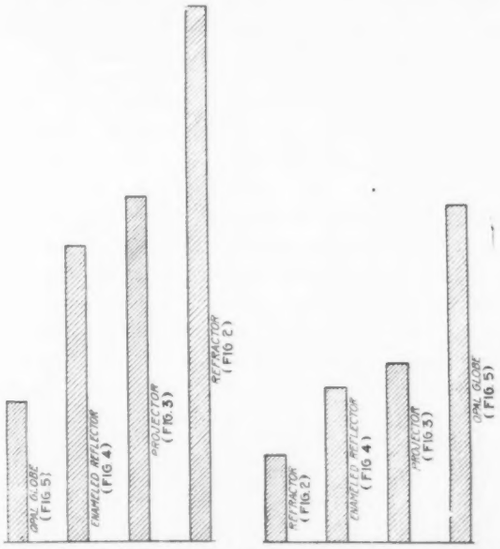
Protective Lighting for Industrial Plants

Discussion Regarding the Intensity and Distribution of Illumination Required, Avoidance of Glare, Available Units and Most Desirable Methods of Installation

BY DAVIS H. TUCK

Electrical Engineer, Holophane Glass Company

AT THE present time, when industrial plants are working night and day turning out the enormous quantities of material required by the government for the successful prosecution of the war, it is necessary not only to illuminate the interior of the plant to conform to recommended practice but it is often of advantage to light the yards so that the workmen may see to pass from one building to another and to perform rough manufacturing work in the yards. With the large number of enemy fanatics at large, it is often necessary to install a system of protective lighting that will enable the guards to apprehend the evildoers.



FIGS. 1 AND 2—COMPARATIVE AREAS ILLUMINATED EQUALLY BY FOUR TYPES OF EQUIPMENT USING THE SAME WATTAGE PER UNIT, AND THE RELATIVE ANNUAL COSTS* OF LIGHTING EQUAL AREAS EQUALLY USING THE FOUR TYPES OF EQUIPMENT

Although this field of lighting is relatively new in its demands, and although practice has not been standardized, there are fortunately several types of lighting equipment which meet the requirements within varying degrees of practicability.

Fundamental Principles.—The fundamental principles of scientific illumination apply to exterior lighting as they do to interior lighting. They are these: (1) The intensity of illumination must be adequate; (2) the illumination must be uniform; (3) glare must be minimized. The details of design of lighting units and the methods of installation are, however, somewhat different.

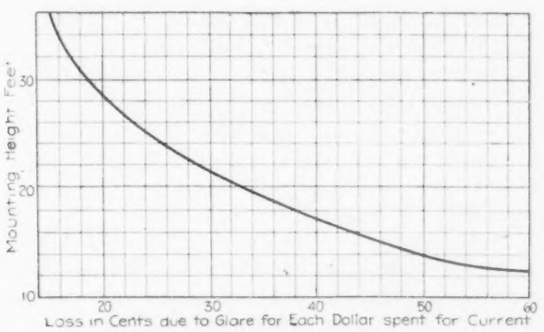
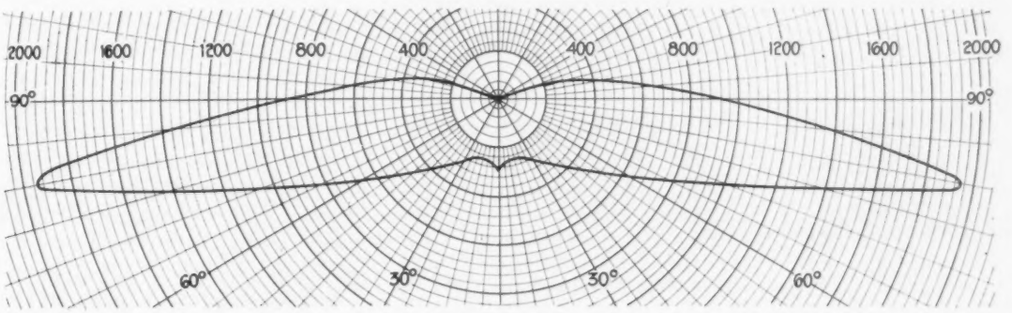


FIG. 4—RELATION BETWEEN MOUNTING HEIGHT AND LOSS OF LIGHT DUE TO GLARE

Adequate Intensity.—The intensity of illumination that is required is dependent upon the purpose for which the exterior illumination is intended. For ordinary yard lighting, where no work is performed and where the purpose of the lighting is only to enable workmen to pass from building to building, 0.025 ft.-candle to 0.05 ft.-candle is recommended. For an adequate system of protective lighting, from 0.05 ft.-candle to 0.2 ft.-candle is recommended. For yard lighting for working purposes, such as loading cars, shipbuilding, etc., an illumination intensity of 0.5 ft.-candle to 2 ft.-candles is advocated.



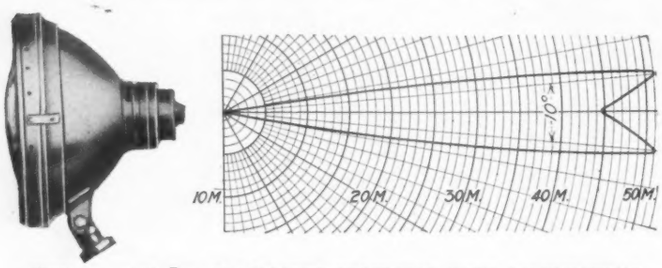
FIGS. 3A AND 3B—PRISMATIC-REFRACTOR UNIT WITH DISTRIBUTION CURVE IN VERTICAL PLANE

It is to be noted that at night the eye requires less illumination for equal discerning power than during the daytime. With the sky and surroundings comparatively dark the eye is adapted to a lower order of bright-

*Cost includes interest on investment, depreciation, maintenance and power cost.

ness, and a relatively feeble stimulus will therefore produce effects equal to those produced by much greater stimuli during the day time.

Uniform Illumination.—It would seem that the fact that the illumination should be uniform would be self-evident. Yet there are many yard-lighting installations



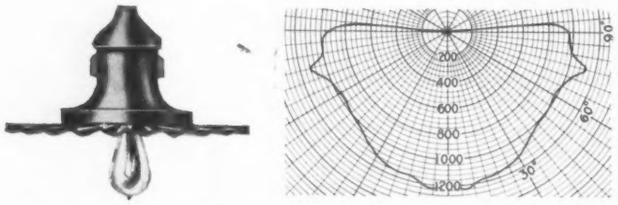
FIGS. 5A AND 5B—FLOODLIGHT PROJECTOR WITH DISTRIBUTION CURVE* IN VERTICAL PLANE

in use where the ratio of maximum to minimum is 300 to 1 or greater. It is evident that if the maximum illumination is adequate the minimum will be inadequate and vice versa. If both the maximum and minimum illumination are adequate, then there is a gross waste of energy and an unnecessarily large investment to carry. The maximum service for the minimum expenditure demands uniform illumination.

The silhouette method of yard lighting is of little avail for working or protective purposes. When an object is seen by silhouette effect only its outlines are visible and not its surface details or characteristics. These can be seen only by illumination effect. In the yard of an industrial plant there are usually many obstructions, such as cars, buildings, piles of material, etc., which offer vertical surfaces against which the contrast of a trespasser is indistinguishable. To provide for safety from attack it is highly important not only to see a person but to recognize the facial and other characteristics which suggest the evildoer. Unless a man has some well-known peculiarity of figure or gait, he cannot be recognized with silhouette lighting.

Glare.—Glare must be minimized. Glare is the result of a light source directly in the field of vision that is extremely bright when viewed in comparison with its surroundings.

It is very important that the yard-lighting system shall produce an effect which will surround those working in or patrolling the yards with conditions under which the eye is free to perform its functions properly.



FIGS. 6A AND 6B—PORCELAIN-ENAMELED REFLECTOR UNIT WITH DISTRIBUTION CURVE IN VERTICAL PLANE

Any system which fails in this respect is an extravagant system, no matter how efficient the lamps nor how efficiently the light may be directed upon the yard surfaces or objects. Glare serves seriously to reduce the discerning power of the eye. Details and more distant objects can be equally well seen at much lower illumination intensities and hence at much lower costs when glare is avoided. Certain popular types of present day yard and protective lighting involve such a degree of glare that equally satisfactory vision would be possible with one-third of the light if the glare were eliminated. The one practicable method of minimizing glare is to mount the units high so as to be out of the ordinary range of vision.

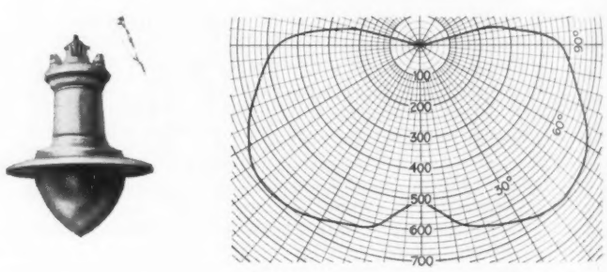
Available Units.—For purposes of protective and yard lighting four general types of equipment are in use:

1. The refractor unit, which gives a very broad, symmetrical light distribution and will uniformly illuminate areas when the units are spaced from eight to twelve times the mounting height (Fig. 3 a and b). In this and the following figures the use of a 500-watt gas-filled lamp is assumed.

2. The flood-light projector, which gives a concentrated beam of about 10 deg. to 20 deg. in a single direction and is adapted for the illumination of relatively small areas in inaccessible places, such as bridge piers (Fig. 5 a and b).

3. The porcelain-enameled reflector, which gives a relatively extensive distribution but which has its maximum candlepower beam at angles near the vertical (Fig. 6 a and b).

4. The opal globe, which gives a distribution similar to the porcelain-enameled reflector (Fig. 7 a and b).



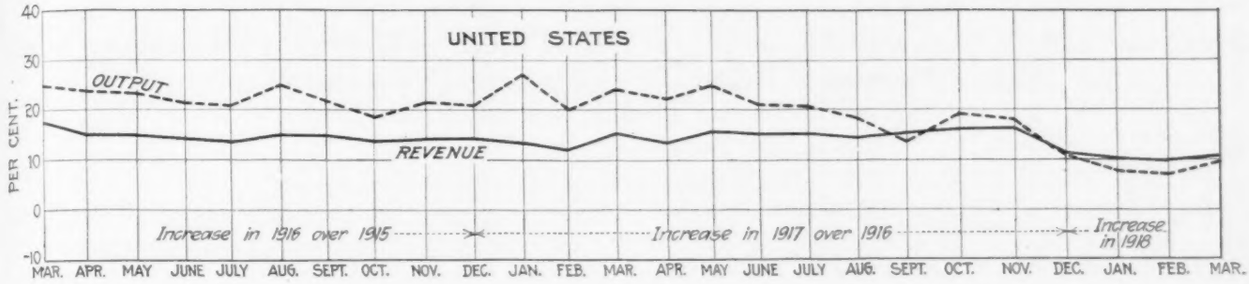
FIGS. 7A AND 7B—OPAL-GLOBE UNIT WITH DISTRIBUTION CURVE IN VERTICAL PLANE

Comparison of Available Units.—The most equitable basis for comparing exterior lighting equipment is that of maximum service at minimum cost. Fig. 1 shows diagrammatically the relative areas equally illuminated, using the four general types of equipment, the same lamp size being used for each. A similar diagram (Fig. 2) shows the relative cost of equal illumination of equal areas when using each of the four general types of equipment.

Method of Installation.—The details of installation depend on the local conditions such as the proximity of buildings, intensity desired, etc. The illumination for a large industrial plant grounds may be divided into two general parts—the protective lighting and the yard lighting. Units should be placed around the plant boundaries to give the illumination necessary to enable watchmen to apprehend trespassers. In close proximity to the buildings there should be other units for the purpose of yard work and for prevention of accidents. The state codes of New Jersey, Pennsylvania, Ohio and Wisconsin all specify that industrial roadways and yard thoroughfares shall be lighted..

*Note that the maximum spread of rays is only 20 deg., while with the units shown in Figs. 3, 6 and 7 the spread is 180 deg.

Central-Station March Operations



CENTRAL-STATION INCOME AND OUTPUT GAIN IN PER CENT BY MONTHS FOR NATION

MARCH business of the central stations, according to the returns made to the ELECTRICAL WORLD, shows a better improvement over March, 1917, than the two earlier months of the year showed over January and February, 1917, respectively. The percentages of gain in March, 11.1 per cent in revenue and 9.1 per cent in kilowatt-hour output, are reported by 51 per cent of the industry.

These gains are still below the large rates of increase reported during the very active months of 1917. Whether the industry is creeping slowly back to the greater scale of increase shown in, say, March, 1917, as compared with March, 1916—14.6 per cent in revenue, 23.6 per cent in output—only a prophet could say positively; but the tendency certainly appears to be toward gradual further improvement. Even if the industry holds a gain of around 10 per cent, that, of course, shows that business is reasonably sustained.

At the same time, it should be kept in mind that the statistics are subject to more acute and diverse influences than ever before, and hence that it is more difficult to draw accurate conclusions from them. In March there was the partial closing of industries as one factor, serious coal shortage as another, the further development of hesitation as to which classes of business are essential or "non-essential," and, what is of more importance with each month now, increased rates.

Following the trend indicated in the earlier months of this year, the rate of increase in revenue was greater than the rate of increase in output.

TABLE I—CENTRAL-STATION RETURNS FOR TWELVE-MONTH PERIOD

Month	Percentage of Industry Represented	Revenue from the Sale of Energy			Kw.-Hr. Output		
		1917	1916	Per Cent Increase	1917	1916	Per Cent Increase
March	64	23,949,000	20,913,000	14.6	1,409,129,000	1,139,453,000	23.6
April	63	22,927,000	20,165,000	13.8	1,328,092,000	1,085,554,000	22.5
May	62	23,369,000	20,307,000	15.2	1,459,085,000	1,163,483,000	25.3
June	63	23,279,000	20,168,000	15.6	1,407,860,000	1,165,629,000	20.8
July	63	22,768,000	19,680,000	15.8	1,397,482,000	1,159,410,000	20.5
August	63	22,718,000	19,972,000	13.8	1,451,928,000	1,223,373,000	18.7
Sept	63	23,861,000	20,896,000	14.3	1,376,370,000	1,219,117,000	13.0
Oct	62	25,748,000	22,334,000	15.4	1,522,149,000	1,279,140,000	19.0
Nov	62	26,665,000	23,183,000	17.0	1,485,370,000	1,292,113,000	15.1
Dec	58	28,144,000	25,026,000	12.4	1,517,001,000	1,362,299,000	11.3
		1918	1917		1918	1917	
January	62	27,035,000	24,977,000	8.2	1,508,353,000	1,422,121,000	6.1
February	60	24,690,000	22,307,000	10.6	1,254,217,000	1,168,288,000	7.4
March	51	23,050,000	20,755,000	11.1	1,271,684,000	1,165,161,000	9.1

The ELECTRICAL WORLD estimate for the entire industry for March, based on the actual returns from 51 per cent of the industry, is: Revenue, $45,196,000; output sold, 2,493,500,000 kw.-hr.

TABLE II—CENTRAL-STATION RETURNS BY SECTIONS OVER A TWELVE-MONTH PERIOD

	Month	Percentage of Industry Represented	New England States			Percentage of Industry Represented	Atlantic States			Percentage of Industry Represented	Central States			Percentage of Industry Represented	Pacific and Mountain States		
			1917	1916	Per Cent Increase		1917	1916	Per Cent Increase		1917	1916	Per Cent Increase		1917	1916	Per Cent Increase
REVENUE	March	64	$2,861,000	$2,547,000	12.3	65	$10,203,000	$8,902,000	14.7	56	$6,692,000	$5,754,000	16.5	86	$4,193,000	$3,780,000	11.0
	April	64	2,756,000	2,357,000	17.0	65	8,601,000	7,765,000	10.7	56	7,132,000	6,094,000	7.0	86	4,282,000	3,821,000	12.1
	May	64	2,640,000	2,253,000	17..	65	9,495,000	8,118,000	16.9	52	6,912,000	5,914,000	16.9	86	4,173,000	3,883,000	7.5
	June	64	2,641,000	2,290,000	15.4	65	9,281,000	8,017,000	15.7	53	6,718,000	5,563,000	20.9	86	4,480,000	4,174,000	7.4
	July	64	2,634,000	2,205,000	19.4	65	8,919,000	7,687,000	16.1	53	6,690,000	5,643,000	18.6	86	4,482,000	4,110,000	9.2
	August	64	2,352,000	2,025,000	16.2	65	9,021,000	7,881,000	14.5	53	6,910,000	5,718,000	20.9	87	4,819,000	4,270,000	21.9
	Sept	64	2,811,000	2,362,000	19.0	64	9,139,000	7,963,000	14.7	53	7,232,000	6,177,000	17.1	87	4,636,000	4,355,000	6.4
	Oct	64	3,057,000	2,530,000	20.7	66	10,683,000	9,173,000	16.5	52	7,422,000	6,304,000	17.8	85	4,586,000	4,327,000	6.1
	Nov	64	3,391,000	2,834,000	19.7	65	10,159,000	8,873,000	14.5	52	8,454,000	7,063,000	19.7	84	4,661,000	4,410,000	5.9
	Dec	64	3,483,000	2,999,000	16.1	58	10,834,000	9,949,000	8.8	48	8,935,000	7,464,000	19.7	82	4,892,000	4,614,000	0.6
			1918	1917			1918	1917			1918	1917			1918	1917	
	Jan	63	3,393,000	2,990,000	13.8	64	9,677,000	9,517,000	1.6	53	8,862,000	7,639,000	16.8	86	5,113,000	4,831,000	5.8
	Feb	62	2,995,000	2,272,000	8.0	57	9,473,000	8,658,000	8.6	53	7,779,000	6,746,000	15.3	84	4,443,000	4,131,000	9.5
	March	62	2,812,000	2,599,000	8.2	54	9,161,000	8,272,000	10.7	44	6,794,000	5,790,000	17.3	77	4,283,000	4,094,000	4.6
KW.-HR. OUTPUT			1917	1916			1917	1916			1917	1916			1917	1916	
	March	64	121,434,000	95,515,000	27.2	65	539,028,000	425,376,000	27.0	56	383,046,000	311,841,000	23.0	86	365,541,000	301,721,000	21.3
	April	64	108,968,000	87,237,000	25.0	65	449,445,000	362,752,000	24.0	56	390,103,000	317,505,000	22.9	86	368,557,000	309,474,000	19.1
	May	64	110,991,000	86,675,000	28.3	65	527,004,000	405,719,000	30.3	52	415,795,000	325,986,000	27.7	86	394,554,000	336,541,000	17.3
	June	64	106,817,000	87,345,000	22.4	65	496,784,000	392,905,000	26.5	53	393,770,000	318,316,000	23.6	86	399,622,000	358,727,000	11.2
	July	64	109,399,000	83,451,000	31.4	65	494,965,000	396,538,000	24.8	53	379,087,000	311,931,000	21.5	86	412,635,000	366,237,000	12.7
	August	64	105,848,000	85,113,000	24.5	65	514,254,000	420,806,000	22.3	53	415,966,000	333,549,000	24.7	87	413,462,000	381,353,000	8.3
	Sept	64	114,339,000	92,319,000	24.0	64	482,112,000	405,070,000	19.0	53	399,480,000	345,953,000	15.5	87	379,221,000	374,685,000	1.4
	Oct	64	121,666,000	94,853,000	28.5	66	589,242,000	472,619,000	24.5	52	417,018,000	351,713,000	17.0	85	394,223,000	359,955,000	9.6
	Nov	64	130,311,000	108,561,000	20.0	65	532,301,000	445,537,000	19.6	52	443,374,000	384,480,000	15.2	84	379,384,000	357,535,000	6.1
	Dec	64	135,703,000	111,342,000	21.8	58	548,316,000	486,368,000	12.7	48	437,264,000	367,534,000	12.8	82	395,518,000	377,058,000	4.8
			1918	1917			1918	1917			1918	1917			1918	1917	
	Jan	63	125,212,000	111,339,000	12.4	64	477,200,000	466,158,000	2.3	53	486,291,000	453,009,000	7.3	86	419,651,000	391,624,000	7.3
	Feb	62	110,454,000	102,562,000	7.7	57	438,721,000	403,122,000	8.3	53	358,276,000	342,257,000	4.5	84	346,766,000	320,025,000	8.4
	March	62	110,362,000	103,753,000	6.3	54	462,487,000	418,157,000	10.6	44	331,138,000	294,120,000	12.3	77	367,697,000	349,151,000	5.3

Electric Buses for City Transportation

Description and Tests of New Equipment for Rio de Janeiro—Example of the Employment of the Electric Vehicle for Urban Use—It Is Giving Very Satisfactory and Economical Service To-day, Notably in England

BY GEORGE DRAKE SMITH

Manager Electric Vehicle Department, Edison Storage Battery Company

THE last two or three years have seen a remarkable increase in the use of electric vehicles as passenger buses, and the success of a number of installations has greatly encouraged their use in this particular field. In England, especially, we find the electric passenger bus in quite common use and giving very satisfactory and economical service.

Recently the Rio de Janeiro Tramway, Power & Light Company decided to put trackless buses in service in Rio de Janeiro. Through its consulting engineers and purchasing agents, the Pearson Engineering Corporation, the company investigated carefully the various types of equipment for a trackless bus line and decided upon electric vehicle equipment.

The specifications and tests of these cars are of interest and are given below. They combine the best practice of the car builder, the electric vehicle manufacturer and the storage-battery manufacturer.

Specifications

Chassis—Commercial Truck Company of America.

Capacity—Thirty-two passengers; 9000 lb., including body.

Tires—United States; 36 in. by 4 in. dual front, 36 in. by 4 in. dual rear.

Motors—Four General Electric 1032 E2W5; 60-volt, 32-amp.; 1200 r.p.m.

Drive—Four-wheel concentric gearing; ratio 12.14 to 1.

Bearings—Axle, Timken taper roller; motor, annular-type ball.

Springs—Silico-manganese, oil-treated steel.

Controller—Continuous-torque type, at base of steering column, four points forward, two reverse.

Brakes—Internal expanding, on all four wheels.

Battery Trays—Angle-iron framing for one battery as specified above, consisting of two trays provided with rollers.

Frame—Four-inch rolled-steel channel with angle-iron and gusset-plate tie members.

Axles—Steel forgings; deep I-beam construction, duplicate, interchangeable front and rear; rear-axle motor wheels arranged for anchoring in a fixed position to the axle.

Mileage—The chassis to develop a speed of 14 miles per hour, in accordance with the mileage rating of the Society of Automobile Engineers, with a load of 9000 lb., and to cover 35 miles with this load and 40 miles with a load of 6600 lb. (half passenger load) on 34 kw.-hr.

Battery—Edison storage battery; 72 cells G-14 type.

Rated capacity, ampere-hours	350
Capacity (normal charge), ampere-hours	399
Capacity (overcharge), ampere-hours	460
Discharge rate (five hours), amperes	70
Discharge rate (three and one-third hours), amperes	105
Average voltage (five-hour rate)	1.23
Average voltage (three and one-third-hour rate)	1.20
Normal charge rate (four and three-quarter hours)	105
Weight complete battery, lb.	2,660
Calculated consumption for the four-hour operating period (27.12 miles) on a normal charge, on the basis of 30 amp.-hr. per round trip of schedule, amp.-hr.	360

The first two chasses to be completed were given trial runs to determine their operation. A course in Philadelphia was selected and the conditions of the tests were conducted so as to approach as nearly as possible true operation of buses in service. The course was over a known distance of 3175 ft. (0.6 mile of city surveyors' maps) of hard asphalt of slight varying grades.

The maximum duty required of a battery on a single charge to maintain the schedule is a total of twelve round trips of 2.26 miles each; mileage, 27.12. The operating period of this part of the schedule is four hours;

TABLE I—VEHICLE TEST NO. 5, OCT. 11, 1917

Trip No.	Time		Ampere-Hours	Net Ampere-Hours	Voltage
	Minutes	Seconds			
	4.39 p.m.		11	Started test	
1	9	5	22	11	89
2	9	40	34	12	89
3	9	30	45	11	88
4	9	25	57	12	87
5	10	5	70	13	86
6	9	35	82	12	85
7	9	45	92	10	84
8	9	15	105	13	83
9	9	20	118	13	82
10	9	35	129	11	81
11	9	35	140	11	81
12	9	26	152	12	80
13	9	37	165	13	80
14	9	37	175	10	80
15	9	35	188	13	79
16	9	37	200	12	79
17	9	22	213	13	78
18	9	15	227	14	77
19	9	20	240	13	77
20	9	45	251	11	76
21	9	50	265	14	75
22	9	35	278	13	75
23	9	15	291	13	74
24	9	35	305	14	73

Finished test, 8.49 p.m. Ampere-hours used in test, 294. Time out, 11 minutes. Actual running time, 3 hours, 59 minutes. Temperature: At start, air, 58 deg. Fahr.; battery, 100 deg. Fahr.; at finish, air, 58 deg. Fahr.; battery, 105 deg. Fahr.

TABLE II—VEHICLE TESTS, GOING AND RETURNING, WITH TWO BUSES

	Vehicle A	Vehicle B
Distance, ft	756,	756,
Time, seconds	35.8, 29.0	41.2, 34.0
Miles per hour	14.4, 17.75	12.5, 15.12
Average	16.07	13.81
Volts	89.0	77.5
Amperes	140.7	137.25
Weight, pounds	19,105	18,300
Watt-hours per 1000 lb.-miles	40.7	42.0
Kilowatt-hours per mile	0.78	0.77
Kilowatt-hours per 35 miles	27.3	26.9
Ampere-hours per mile	8.75	9.92
Ampere-hours for 35 miles	306.0	347.2

running time, twenty minutes per round trip, which includes a total of twenty-four stops. The battery is then withdrawn from service for a time sufficient for a complete recharge. The distance from end of route to charging station is approximately ½ mile.

Test Conditions

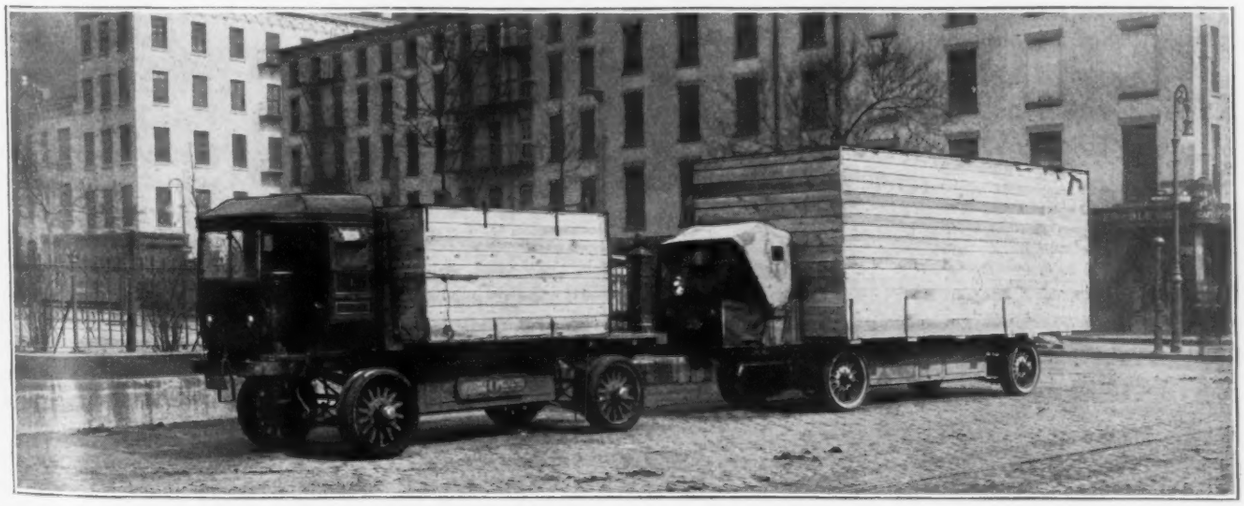
The battery was completely charged at the chassis manufacturer's service station, placed into the battery compartment of the chassis, and with the total load

driven to the test course, a distance of approximately 1½ miles. In this condition the chassis was run over the test course for forty-eight trips, a total mileage of 28.8. On each trip the vehicle made six full stops. Periods of acceleration, coasting and braking were carried out as in actual bus service. At the completion of this run the vehicle was driven to the charging station and the battery recharged at 105 amp. for four hours and twenty minutes. At the completion of this charge the loaded chassis was again driven to the test course and another test of forty-eight trips made under the same conditions as the first. At the finish of this second test run the vehicle had been operated for such a period and under conditions so similar to actual service schedule as to enable the performance of chassis and battery to be determined.

From these readings the ampere-hours per mile and the kilowatt-hours per mile are readily calculated. The tests were run over a staked part of the above course of a distance of 756 ft. The vehicle was under full power for the entire distance from a flying start. Table II gives the record.

It is a matter of record that vehicles of this construction with the controller arrangement and the four-wheel, four-motor driving and braking will not skid under the most severe conditions of operation. During the above tests this was demonstrated under conditions of heavy rain and where the pavements were covered with fallen leaves. The chassis with the entire test load was fully braked when running at full speed, and the vehicle was driven around corners of 90 deg. street intersection. Furthermore, the chassis was driven through such an angle at full speed, with power off and brakes on, and in no instance was there any tendency to skid.

ELECTRIC BUSES OF THE TYPE SHOWN AT THE RIGHT HAVE BEEN PURCHASED FOR STREET TRANSPORTATION AT RIO DE JANEIRO BY THE PEARSON ENGINEERING CORPORATION FOR THE RIO DE JANEIRO TRAMWAY & LIGHT COMPANY. THEY WILL OPERATE UNDER ROADWAY AND TRAFFIC CONDITIONS SHOWN AT THE LEFT



THE BUSES WERE SHIPPED FROM PHILADELPHIA TO NEW YORK UNDER THEIR OWN POWER. SEVEN TRIPS WERE MADE FROM PHILADELPHIA. BRIDGES AND VIADUCTS WERE MEASURED IN ADVANCE. VESTIBULES ARE SHOWN PACKED FOR FOREIGN SHIPMENT ON THE FIRST CAR, AND THE MAIN BODIES ON THE SECOND CAR, IN CRATES 10 FT. BY 10 FT. BY 20 FT.

Several tests were made of the buses before their acceptance. Table I gives the result of one of these tests.

The vehicle was driven over the known distance, and readings of volts, amperes and time were recorded. Readings were taken for both directions of travel of the above distance, to take care of any variations due to grades, and an average of these readings was taken.

The writer is indebted to the Pearson Engineering Corporation, 115 Broadway, New York City, for the specifications and figures which are contained in this article.

STATION & OPERATING PRACTICE

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

METER-TESTING PRACTICE OF SMALLER COMPANIES

How to Get Along Without a Precision Instrument —Cause of Trouble in Rotating Standards and the Remedy for It

A Minnesota company which feels that it cannot afford to purchase a precision meter by which to check its standard meter has developed a scheme for determining in a rough manner whether or not the accuracy of the standard is being maintained. Two good customer's type meters are mounted permanently at a carefully chosen location in the company's meter room and adjusted to run at as nearly 100 per cent accuracy, compared with the standard, as possible. The standard is checked against each of these meters at frequent intervals. So long as all three meters indicate no change the company considers it reasonable to assume that no inaccuracy exists in the standard meter. When there is disagreement, however, the standard is sent away to be checked.

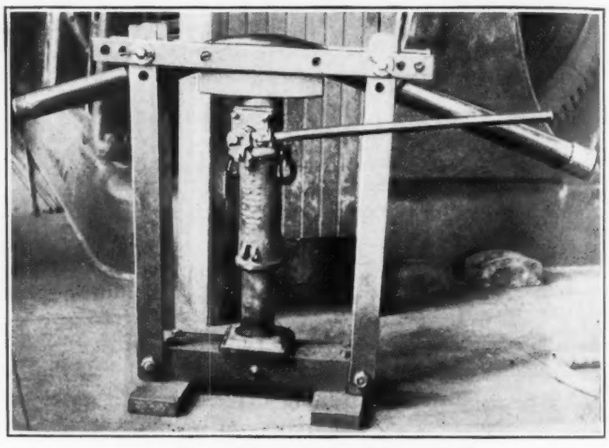
The customer's type meters which are used to check the standard are kept running constantly on a very light load created by small lamps. This is done since it is thought that they will retain their accuracy better while running than if they are operated only occasionally. Experience has shown that very often the inaccuracies in the rotating standard meter can be traced to the cord which is attached thereto. Consequently this cord is renewed at frequent intervals.

HOME-MADE CONDUIT BENDER SAVES TIME AND MATERIAL

Bends 20,000 Ft. of Cold Conduit in Many Varieties of Shapes Without Spoiling a Foot of Material

A simple but effective device for bending cold conduit has been developed by E. A. Phipps of the Rockingham County Light & Power Company, Portsmouth, N. H., and has saved considerable time and labor in the reconstruction of this company's power plant. As illustrated here, the outfit consists of a frame upon which a jack can be placed to press against a shoe conforming to the general shape of the conduit. Other shoes are provided at the upper corners of the frame, where they are pivoted so that they will adjust themselves to the curvature of the conduit. The effectiveness of the equipment depends chiefly upon the drawing effect of the shoes.

The outfit will bend any iron-conduit pipe from 1.25 in. to 4 in. (3.2 cm. to 10 cm.) or larger in diameter, using any make of jack on the market. The device is light, portable, easily operated by one man, and can be used in straightening as well as in bending conduit. It will make a 90-deg. bend without flattening the pipe considerably because the recess in the shoe immediately over the jack is relatively deep. Only one piece—the central block—has to be changed in adapting the bender to different-size pipe. The frame occupies a space of only about 3 ft. (0.9 m.) high by 3 ft. (0.9 m.) long by 18 in. (45 cm.) wide. A bender of this type has been used at Portsmouth, where more than 20,000 ft. (6096 m.) of conduit, requiring every variety of bend, was necessary, without destroying a single piece of stock. Furthermore, a great saving was effected by not using the usual heating method. It is estimated that the machine easily paid for itself in making the first fifty bends.



CONDUIT BENDER CAN BE OPERATED BY ANY TYPE JACK

EFFICIENT USE OF GAS FOR FUEL IN COAL-FIRED BOILERS

Large Combustion Chamber Needed for Complete Combustion of Gas—Good Construction Allows Boilers to Be Run at 200 per Cent of Rating

The desirability of gas for fuel because of its cleanliness was emphasized by L. A. White, superintendent of the Muskogee Gas & Electric Company, before the annual convention of the Oklahoma Gas, Electric & Street Railway Association. No stoking or cleaning of fires is required, and a number of boilers may be attended and a constant load maintained independent of manual labor.

There are many difficulties, however, in using gas for fuel. Combustion must be completed before the gases come in contact with the comparatively cool boiler tubes because the ignition temperature of the Marsh gas is 1233 deg. Fahr. This can best be accomplished by high boiler settings and large furnaces. The furnaces must also be constructed to prevent the flame from impinging on the tubes, and if this is done, boilers may be utilized for more than 200 per cent of rating without difficulty.

Mr. White said that most of the boilers at Muskogee were originally coal-fired, but when gas burners were installed the grates were covered with firebrick and the

burners placed in the furnace door. The flame was then directed against a checkerwork about 30 in. (76 cm.) from the end of the burner. This arrangement proved to be satisfactory as long as the boilers were not driven hard, but where the demands on the boilers increased the grates were removed, the ash pit lined with firebrick and the majority of the burners placed in ashpit doors. This doubled the size of the combustion chamber and increased the rating of the boilers. Theoretically the reason for driving the flame against the checker wall was to assist combustion by presenting an incandescent surface to the gases, which thus insured ignition and directed the hot gases against the heating surface of the boiler at right angles to it. The effectiveness of a square foot of heating surface obtained by this method should be about eight times that of a similar area arranged parallel to the gas flow. The factor of time is not accounted for in the theory, and the course of the gases is actually diverted and directed against the tubes, where the gas is cooled below the temperature of ignition and combustion arrested.

In operating a group of boilers without steam-flow meters it is possible inadvertently to drive one or more of the boilers beyond safe limits, owing to the condition of the burners either in lagging or leading boilers. The orifice of the burner sometimes becomes obstructed, thereby diminishing the flow of gas in one boiler. If this condition is not general, the load will naturally shift to the other boilers and a high gas pressure will be carried to offset the delinquency. "Scale is not always the cause of tube burning," said Mr. White, "for in 1911 a 500-hp. boiler was installed at Muskogee with twenty-two gas burners. The other boilers were of the same size and type but were equipped with fifteen gas burners. On the first night's run with this boiler operating on the same line with three of the fifteen burner boilers and pulling a 2000-kw. load, twelve tubes in the first row were burned out." A gas fire should burn with a blue flame and white heat, and the presence of a white flame indicates carbon monoxide. The only sure method of judging the efficiency of a furnace is with the Orsat apparatus, but without a collector for obtaining continuous sample or an automatic CO_2 recorder maximum efficiency is likely to be obtained only during the test.

PREVENTING SPONTANEOUS COMBUSTION IN COAL PILE

Laying Screenings Evenly and Subjecting Them to Heavy Rollings Eliminates Possibility of the Fires Likely in Loosely Made Piles

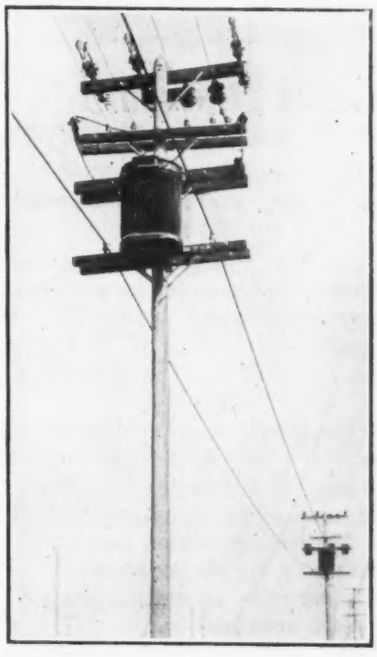
An interesting experiment has been carried out at the University of Illinois in stocking No. 6 Illinois coal mined near Georgetown, Ill. For several years it has been customary for the university to stock 4000 tons to 5000 tons of coal on the ground in piles about 12 ft. (3.7 m.) high, the coal being thrown from railroad cars onto the piles and distributed by scrapers. At times fires occurred in these piles.

During the summer and fall of 1917 a pile of about 10,000 tons of coal was placed on an old tennis court which furnished a hard foundation. This coal was piled to a depth of 10 ft. (3 m.) or 12 ft. (3.7 m.) and surrounded on three sides by a light fence 7 ft. (2.1 m.) high. The coal was transported to the tennis court by means of a motor truck, and the entire surface of the ground was covered to a depth of from 2 ft. to 5 ft. (0.6 m. to 1.5 m.). This layer of coal was then rolled with a heavy roller to pack it down tightly and exclude the air as much as possible. The fence, of course, assisted in excluding the air around the edges of the pile. Plank roads were then laid over the top of the pile so that the motor truck could dump more coal on top of the layer which had been rolled. This process was repeated continuously until the pile was completed. According to H. H. Stoek, professor of mining engineering at the University of Illinois, this method of storing coal proved rather successful. While heating developed in a couple of places where other coal had been mixed with the screenings, the method otherwise proved entirely satisfactory. The cost of storing and reclaiming coal handled in this way averaged about 40 cents per ton.

TRANSFORMERS OF THE SAME BANK ON DIFFERENT POLES

Bank of Units Too Large for One Pole Placed on Adjacent Poles—Cut-outs on One Pole Connected to Other by Buses

Two or possibly three transformers of a bank can be placed on adjacent poles when the location of the transformers on the ground or on a two-pole platform is not feasible. The illustration shows connected in open delta two 2200-lb. (998-kg.), 50-kva. transformers that were too heavy for mounting on one pole. They are installed on a railway right-of-way where a



TWO-POLE PLATFORM ELIMINATED ON RAILWAY RIGHT-OF-WAY

two-pole platform was undesirable. All the cut-outs are on one pole with buses connected to the other transformer, as this is preferable to the installation of a pair of cut-outs on each pole. Line switches are shown in the photo, one placed on each side of the bank. As the bank is in a loop line it may be kept energized while work is done on the line on either side.

CENTRAL STATION SERVICE

A Department Devoted to Commercial Policy and Management Topics, Including Applications of Electric Light, Power and Heat

TABULATION OF THE COSTS OF USING ELECTRIC TRUCK

Expense of Electrical Energy per Car Mile for 750-Lb. Truck at 3 Cents per Kilowatt-hour Amounts to 0.8 Cent

Following is a record of a 750-lb. electric truck used in ordinary city deliveries for thirty working days, prepared from data supplied by the Electric Vehicle Section, N. E. L. A.:

Days operated	30
Miles traveled	1,140.5
Kilowatt-hours used	319.5
Number of miles per kilowatt-hour	3.57
Greatest energy consumption for one day, kw.-hr	13
Smallest energy consumption for one day, kw.-hr	10
Average energy consumption for one day, kw.-hr	10.65
Shortest run, miles	33.5
Longest run, miles	46.5
Average run, miles	38.01
Greatest merchandise load (overload of 750 lb.), lb	1,500
Smallest merchandise load, lb	500
Average merchandise load (overload of 250 lb.), lb	1,000
Energy cost per car mile at 3 cents per kw.-hr	$0.008
Energy cost per car mile at 4 cents per kw.-hr	0.011
Energy cost per car mile at 5 cents per kw.-hr	0.014
Maintenance (maximum estimate) including repairs and renewal of all mechanical and electrical parts, including tires, battery and painting of wagon, should not exceed per car mile	0.04

APPLIANCES TO OFFSET DAYLIGHT-SAVING LOSS

New Orleans Company Redoubling Sales Efforts with the Result of Considerable Additional Profit

"Daylight saving" will result in considerable loss in revenue unless a vigorous campaign for broadening the use of electric labor-saving appliances in the home is pushed through, according to W. E. Clement, contract agent for the New Orleans (La.) Railway & Light Company.

Realizing the need for overcoming the loss in lighting revenue, the commercial department of the New Orleans company is redoubling its efforts toward the sale of appliances. This campaign, instead of proving an expense from a promotion standpoint, is actually turning out to be a big money maker.

Vacuum-cleaner sales, on which there is a large profit, show an increase over last year, Mr. Clement states, of several hundred per cent; sewing-machine motors, 50 per cent; vibrators, 40 per cent, and miscellaneous appliances, 182 per cent.

Foreseeing the necessity for boosting the sale of appliances, the manufacturers were called upon to supply about 30,000 pieces of advertising matter showing summer electric goods, all of which are now being distributed by means of boxes placed in street cars. In addition, the company is using bill stickers, car cards and a small amount of newspaper space. Fans especially are being featured at present, it being foreseen that on account of the extra hour in which business men will be at home during the heat of the afternoon a great demand for fans will result.

Extra tables are being placed in the salesroom carrying miscellaneous electric appliances, with such seasonable articles as wicker lamps in great abundance, a large sale being anticipated on this class of goods.

On the floor a special sewing-machine demonstration has been arranged, and visitors to the office cannot fail to be attracted by the sight of a young woman rapidly running off summer goods on a machine in full sight of passers-by.

TAXES WHICH AFFECT THE PUBLIC UTILITIES

Injustice of Subjecting Properties to Large Additional Burden of Expense Which They Cannot Pass on to the Consumer

At the present time, when utilities are finding it so hard, in spite of large gross earnings, to make both ends meet, additional expenditures make it all the harder to show any profit. Among such expenditures which have been greatly enhanced by the war are taxes. There have been some new taxes and some taxes have been increased. In addition, the expense attached to making out a tax report sheet is a very considerable item. The injustice of the increase of taxes to which utilities must submit without recourse to higher rates was outlined by H. Spoehrer, secretary and treasurer of the Union Electric Light & Power Company, St. Louis, Mo., before the Missouri Association of Public Utilities at the recent convention. Mr. Spoehrer said in part:

Supplementing the normal taxes we have had enacted recently by each of the divisions of the government additional taxes to meet extraordinary needs, the accumulation of which is becoming rather burdensome, especially since the utility has not been offered the means with which to meet these demands. There would, of course, be no cause for complaint as to such taxes as are levied against all industries indiscriminately, provided that the sale price of the utility's commodity were advanced and any additional tax thus borne by the consumers as is the case in other industries, instead of reducing the earnings of the stockholders, which with the utility company are already limited.

One of the cardinal principles of a public utility is the avoidance of the practice of discrimination, yet legislative bodies have no hesitancy in levying discriminating taxes against utility corporations, notwithstanding the fact that earnings of these companies are already regulated and limited.

Special taxes should, therefore, be eliminated. Under this class I include such items as franchise taxes and gross income taxes, which are not exacted of other industries.

The array of general taxes, federal, state and municipal, now in effect presents the following:

First—The general property tax under which all tangible

property owned by the taxpayer, real and personal, is taxed at the rate of $2.35 per $100.

Second—Merchants' and manufacturers' license tax of $1 per $1,000 of sales or gross receipts.

Third—The federal income tax. This tax, originally 1 per cent of the net income of the corporation, was later increased to 2 per cent. In October, 1917, it was again increased, now amounting to 6 per cent of the net income of the corporation. Under this title also we may mention the 2 per cent normal personal income tax which the corporation pays on behalf of the holders of any of its bonds which contain a tax-free covenant.

Fourth—Ten per cent federal tax on undistributed income. This is a new tax, effective Jan. 1, 1917, and applies on the amount of earnings remaining undistributed six months after the end of each calendar or fiscal year.

Fifth—Federal capital stock tax levied at the rate of 50 cents per $1,000, or one-twentieth of 1 per cent on the fair value of the capital stock of the corporation in excess of $99,000. This tax will cost our company $6,200 in 1918.

Sixth—Federal war excess profits tax. This tax varies, depending on the amount of earnings and the invested capital of the corporation. Since it is impossible for a public utility to derive excess profits from its business, this tax concerns us chiefly by the annoyance and time consumed in making the formal returns.

Seventh—Federal freight tax, a tax of 3 per cent on the amount paid on freight bills. This is a new tax, which we estimate will affect our company this year to the amount of $6,150.

Eighth—Express tax of 5 per cent on amounts paid for express charges will amount to $230 for our company in 1918.

Ninth—Federal tax on telegrams and telephone calls, at the rate of 5 cents per message on all messages costing over 15 cents, will amount to a tax of $220 on the business of our company this year.

Tenth—May be mentioned, not perhaps distinctly as a tax, but as increased cost of mail service; the increase in postal rates is 100 per cent on post cards and 50 per cent on all except local letters.

Eleventh—Documentary stamp taxes, including those on issues of capital stock, will cost our company more than $10,000 during the year.

Twelfth—State franchise tax of 75 cents per $1,000 of the outstanding capital stock and surplus of the corporation employed in this State. This will affect our company to the extent of $17,500.

Thirteenth—State income tax, amounting to one-half of 1 per cent of the net income. This peculiar law is now under test by an action brought by the St. Louis Chamber of Commerce questioning its validity.

Fourteenth—State-secured debts tax, a new stamp tax imposed by laws of 1917 on obligations at the rate of 5 cents per $100 per year to the maximum of 25 cents per $100, will affect us to a slight degree in the issuance of securities.

Fifteenth—State motor-vehicle license tax, which by the 1917 session of the State Legislature was increased 100 per cent. The increased burden on our company by this tax amounted to more than $600 this year.

Sixteenth—Fees on security approvals. Though not an ever-present item of taxation, a complete list should include the fee of $1 per $1,000 which these utilities must pay to the Public Service Commission upon the approval of issues of stocks or bonds. We are not objecting to this tax, since it is applied to the maintenance of the commission, and it is probably fair that we help support the boss; but it may be pointed out that no other lines of business are taxed in a similar manner to support a regulatory body having at its principal purpose the limiting of the earnings of such business.

Seventeenth—Annual registration fees. Though practically negligible in amount and concerning us chiefly on account of the time and expense consumed in compiling the report, the annual corporation registration fee of $5 constitutes another tax to which we are subject.

Eighteenth—City and county secured debts tax, levied by the counties and by the city of St. Louis, both as a county and a city, thus making this tax in St. Louis amount to twice the state tax under the same law.

Nineteenth—City motor-vehicle license tax, in amount equal to one-half the state tax. The total state and municipal motor vehicle license taxes added to the chauffeurs' license taxes paid by our company will this year be approximately $2,400.

These, together with the franchise tax of $117,500 and the 5 per cent gross income tax of $190,000, make a remarkable total of twenty-one different taxes paid by our company in St. Louis. The enormity of this burden is more clearly perceived when it is stated that the aggregate total of all this taxation exceeds $539,000 per year, amounts to 12.8 per cent of the gross receipts from the distribution of electricity in the city of St. Louis, and exceeds the total net income of our company for the year by more than 30 per cent. Thus it is seen that the federal, state and municipal governments, without having a cent invested in the enterprise, receive a greater amount out of the earnings of the company than is received by the stockholders who have furnished the entire investment. It must be remembered also that this is taxation to which we are subject while earning an income of a very small percentage on the total investment, a percentage which has been reduced to an "irreducible minimum," and without the application of excess profits taxes, since the realm of such profits is wholly strange to public utilities.

Neither does the amount paid in these taxes represent their actual cost to the utilities. The cost in time and labor consumed in preparing the data for the returns and the making of the returns themselves, together with other returns occasioned by these and other taxes, such as information returns under the personal income tax laws, has increased until the amount so consumed represents a heavy expense.

A list of the returns and reports occasioned by these various tax laws includes the following:

(a) To the federal government: (1) Income tax returns; (2) capital-stock tax return; (3) war excess-profits tax return; (4) monthly income tax return of personal tax withheld at the source; (5) annual return of information under income tax law on payments of $800 or more to all employees and a large class of recipients.

(b) To the state government: (6) Income tax return; (7) franchise tax return; (8) annual corporation registration.

(c) To the local or municipal government: (9) Personal property tax return; (10) 5 per cent gross receipts return, made twice yearly; (11) merchants' or manufacturers' license tax return.

It is clear that all these returns and reports require a vast amount of statistical work.

In this review of our tax problems and burdens we do not mean to criticise all the forms of taxes or object by wholesale. Some of these taxes are both necessary and correct in principle and are, therefore, above reproach. What we wish to emphasize are the staggering proportions to which taxation grows by its cumulative effect, and especially to point out that with the load of necessary general taxation it is high time that special taxation discriminating against public utilities should be objected to and abolished. As before stated, the worst of these are franchise taxes, and in St. Louis, the 5 per cent gross receipts tax. The particular vice of this tax is that it imposes on the utility, and through it upon its patrons or consumers, a tax to obtain revenue which is used for general purposes and to the benefit of the whole public, including those who are not users of the service and, therefore, bear no share whatever of the tax.

These special forms of taxation should be eliminated, and in view of the present period of exceptionally heavy general taxation, due recognition should be taken by the commission of the needs of the utilities to enable them to meet the situation by a proper increase in rates charged for utilities' service.

Every public utility in the State is subject to this great load of taxation, with the possible exception of franchise and gross receipts taxes, depending on local conditions. The suggestion of rate adjustments is pertinent, therefore, especially in view of the important function of the utilities in this time of national need. Adequate earnings are obviously necessary to enable the utilities to operate with efficiency.

TECHNICAL THEORY & PRACTICE

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

Generators, Motors and Transformers

Characteristics of the Induction-Type Generator.—The inductor-type generator has come to be universally recognized as the standard type of generator for the 500-cycle, single-phase power supply of the modern wireless-telegraph stations. The principles of operation and methods of testing and predetermining the operating characteristics are discussed.—*Electrical Review*, April 27, 1918.

Improvement of the Turbo-Alternator.—An editorial comment on S. F. Barclay's paper, presented before the Institution of Electrical Engineers, which gives the relative advantages of solid and built-up rotors for machines of large output. In large machines the solid rotor construction has inherent defects which have not yet been eliminated. The larger the diameter or the greater the volume of the rotor, the more likely are the defects to become pronounced. Ductility varies considerably through the mass, and the heat treatment does not penetrate to the center of a large forging, nor is it uniform in the case of a hollow forging having walls of considerable thickness. A large forging can neither be tested nor inspected with the same degree of thoroughness as by the test and inspection methods in every-day use in the machine shops. Forgings are very difficult to obtain in large sizes as there are very few who could undertake the work. On the other hand, the built-up rotor has none of these objections as the plates are thin and no part is more than an inch from the surface. The construction difficulties of the built-up rotor are much greater. Outputs of turbo-alternators become restricted owing to insufficient cooling surface or ineffective cooling surface, and since the area of the cooling surface cannot be greatly increased, a means of improving its efficiency will have to be found before there can be any radical increase in the specific output. Improvements in the design and construction of the end bells—or, preferably, improved design and arrangement of the rotor winding of such a kind as to eliminate the end bells—would simplify the design. Without epoch-making discoveries the designer will have to be content with copper and its troublesome losses and defective mechanical properties. The magnetic properties, however, as well as the reduction of the specific loss in commercial iron, can be greatly improved.—London *Electrician*, April 5, 1918.

Lamps and Lighting

Lumens Versus Candles.—H. ARMAGNAT.—The candle-power unit in general use in the commercial classification of incandescent lamps does not respond to modern needs, and its meaning has been so changed in current phraseology that it has become necessary to substitute for it the unit of flux, which defines better the quantity sought. The author thinks that this substitution has met with stronger resistance in France than in other countries and makes a mathematical and diagrammatic argument in support of the contention that the lumen should be adopted for the classification of lamps and the candle restricted to its precise sense as a unit of intensity.—*Revue Générale de l'Electricité*, April 27, 1918.

Glasses for Protecting the Eyes from Injurious Radiations.—W. W. COBLENTZ and W. B. EMERSON.—General characteristics of certain newly developed glasses used for protecting the eyes from injurious forms of radiant energy, especially the infra-red or so-called heat rays, are given. Because of the difficulty in reproducing the same color in different melts, no attempt is made to give specific data on the transmission for a given thickness of glass. These glasses under consideration are known as euphos, fieuzal, akopos and noviweld. An appendix indicates which part of the radiation from a gas-filled tungsten lamp, a magnetite arc and a quartz mercury-vapor lamp is transmitted through various substances, thus showing in a condensed table the protective properties afforded by these glasses.—*Technologic Papers of the Bureau of Standards*, April 4, 1918.

Generation, Transmission and Distribution

Radiant Heat and Fire-Box Design.—JAMES T. ANTHONY.—The amount of heat absorbed by boiler surfaces due to radiation depends upon two things—first, on the area of the radiating surfaces; second, upon the temperature. If the firebox heating surface is increased without increasing the area of the heat-radiating surfaces or their temperature, there will be practically no increase in the amount of heat radiated. With coke or a hard coal that burns without any flame, the total amount of radiating surface would be equal to the grate area, so that increasing the firebox heating surface would have only little effect on the firebox evaporation. When using a highly volatile coal, however, the heat radiated from the fuel bed can be disregarded, for in this case the temperature and extent of the flames become the controlling factor. The flames, being interposed between the heating surfaces and the fuel bed, absorb the heat radiated from the fuel bed in addition to the heat being generated within the flames by the burning combustibles and radiate this heat to the surrounding heating surfaces. It is then apparent that increasing the capacity of the firebox and filling the added volume with flame results in increasing the radiating surface and the amount of heat radiated. The amount of flame in a firebox depends primarily upon the amount of combustible gas being driven off, the air supply and the volume of the firebox. With a fair grade of bituminous coal and ordinary firing methods, fully 50 per cent of the heat generated in the firebox is due to the burning of combustible gases above the fuel bed. In order to burn these gases completely it is necessary to have an excess of oxygen above the fuel bed, to mix the oxygen intimately with

the combustible gases, and to provide sufficient flameway or combustion chamber space. If the mixture is not thorough and the quantity of oxygen is not sufficient, the gases will burn more slowly, the flames will be longer, and combustion is apt to be incomplete.—Extracted from paper read before the Central Railway Club, May 10, 1918.

Current-Limiting Reactances. — The desirable features that reactors should possess and the details of construction to fulfill these requirements are discussed. —London *Engineer*, April 12, 1918.

Installations, Systems and Appliances

Low Temperature Industrial Heating.—DWIGHT D. MILLER.—The operation, control and advantages of this type of heating are considered in the conclusion of the paper. A short discussion is presented of how the heating load is acquired and the advantages of electric cooking. The author states that the most important advantages obtained by the use of the heat of electric energy are that it can be generated in any quantity regardless of temperature and that it may be absolutely and exactly controlled. Many commercial processes can be carried on with the same accuracy and duplication of results as can be obtained in the laboratory, and many uncontrollable variables are eliminated. With the ordinary combustion-heating process a slight change in the humidity of the air or velocity of the wind will have a pronounced effect on the results obtained, whereas if electric heating is employed no effect is noted.—*Ohio Electric Light Association Monthly*, April, 1918.

Design and Operation of a Small Kjellin Furnace.—GEORGE H. STANLEY and W. BUCHANAN.—The authors point out that an induction furnace is somewhat similar to a single-phase, core-type alternating-current transformer subject to the limitation of non-sandwiched windings and a horizontal position of the secondary. Data on the cost of operating such a furnace are given as follows:

Scrap, 70 tons at £1	£70	$339.50
Pig iron, 1½ tons at £20	30	145.50
Aluminum, 30 lb. at 2 shillings	3	14.55
Magnesite (calcined), 2 tons at £18	36	174.60
Miscellaneous stores	15	72.75
Repairs and renewals	15	72.75
Tools, etc.	5	24.25
Electric power	200	970.00
Cartage	30	145.50
Miscellaneous sundries	20	97.00
Salaries, wages and supervision fees	400	1,940.00
	£824	$3,996.40
Per ton, nearly	14	66.50

—*Journal of South African Institution of Electrical Engineers*, September, 1917.

Experiments in the Electrothermic Production of High Temperatures.—JEAN ESCARD.—The author describes the mode of employment and the principal object of the chief laboratory ovens employed in practice, including ovens with resistant metallic plates or wires surrounding refractory tubes, arc ovens, arc ovens with resistance, and resistance ovens simply.—*Revue Générale de l'Electricité*, April 13, 1918.

Steel Fusion Welds.—When steel is welded by the aid of the oxy-acetylene blowpipe or the electric arc, the heating is very local and the grains become coarser. This is particularly noticeable with arc-welding, in which heating and cooling are more rapid. On the grain boundaries cementite appears, sometimes pearlite. A microphotographical study of the welds brings out other interesting peculiarities, said S. W. Miller, proprietor of the Rochester (N. Y.) Welding Works, before the American Institute of Mining Engineers. The paper he presented was illustrated by a large number of photographs. In addition to the cementite spots, there are generally fine specks of oxide. Welding also seems to introduce gases—nitrogen and probably hydrogen—into the steel unless the welding rod—generally a low-carbon wire of 0.1 per cent or 0.18 per cent of carbon—contain manganese or vanadium. These constituents have the disadvantage, however, that they cause a slag to form which does not easily float to the surface. The burning and agitation of the steel also leads to a change in the carbon content. Electric welds further show peculiar fine lines or cracks which seem to be the sides of diagonals of squares. Miller has found, the author said, that they darken when boiled in sodium picrate, are more numerous with high-carbon wire than with low-carbon wire, and disappear after heating the specimen above 750 deg. C. and then cooling at certain rates. On the other hand, the lines widen in steps on prolonged etching, which would be compatible with their being lines of incipient fracture along planes of cleavage.

Electrophysics and Magnetism

Radiation from Systems of Electrons.—SIR J. J. THOMSON.—The author deals particularly with the phenomena which are generally discussed under the heading of "Roentgen Rays and Crystal Structures," though he does not use that expression. He says that the center of the disturbance is generally supposed to be the atom, whereas one really has to deal with two sets of gratings, that due to the arrangement of the atoms in parallel planes and that due to the grouping of the electrons of the atom. Each set of gratings has its own system of spots.—London *Electrician*, April 5, 1918.

Precharged Condensers in Series and in Parallel.—V. KARAPETOFF.—By "precharged" the author means that a condenser is charged from a source of direct voltage and then is used as a booster in series with this source to charge another condenser. By repeating this process a large number of times the second condenser is finally subjected to twice the voltage of the source. This is considered in series, parallel and network of condensers.—*Proceedings A. I. E. E.*, May, 1918.

Miscellaneous

Central Heating as a Means of Conserving Fuel.—F. G. CLARK.—The ideal system would utilize low-pressure steam from a steam electric power plant, which could be taken from the low-pressure stage of steam turbines through suitable regulating valves and be superheated by a suitable heat exchanger before passing into the street mains. The conditions which best suit this method of supplying heat are a closely built-up section of a city and a central location for the supply plant, which usually provides for a fan-like distribution system. As an economic proposition the central heating plant can offer to customers in a limited district a supply of heat for approximately what their coal would cost them, leaving a fair return on the central heating system investment.—Toronto *Electrical News*, May 1, 1918.

NEWS OF THE INDUSTRY

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields

TWELVE GOLF BALLS BRING IN THIRTY-FOUR HUNDRED DOLLARS

This Sum Realized for the Red Cross by Successive Auctions of These Articles at Last Week's Hot Springs (Va.) Convention

BY O. FRED. ROST
Member Electrical Supply Jobbers' Association

Boom! Boom! Boom!

While a number of murdering, brutalized sky pilots sent out by the "Beast of Berlin" were bombing hospitals back of the Allies' lines, were killing some of their own wounded along with those of the enemy and murdering nurses and Sisters of Mercy, a gathering of business men representing all sections of the United States quite unexpectedly made a demonstration which, when it finally ended, proved to have raised a substantial fund for repairing some of the damage caused by those murderers.

The members of the Electrical Supply Jobbers' Association had once more invaded the peaceful valley in the Virginia mountains where at Hot Springs the Homestead Hotel spreads itself along the mountain.

Although not many months previously it had donated a fully equipped ambulance to the American Red Cross, the association again voted a donation of several thousand dollars to this body. Just before adjournment a messenger brought to Franklin Overbagh a box containing twelve golf balls donated by the manufacturer as a prize in the golf tournament. No tournament having been scheduled on account of matters pertaining to the war requiring the greater part of the time, the golf balls were to be auctioned off for the benefit of the Red Cross.

Here was an opportunity to make good, and the suggestion that the golf balls be auctioned off separately, instead of as a lot of twelve, was readily carried out. Whoever made the suggestion surely did not know what was being started, for those balls, being round, kept right on rolling. From offers of $25 for one golf ball the bids soared higher and higher until over $100 was bid. Frank Price of Boston purchased the privilege of auctioning off the last ball and brought a record figure.

The twelve original purchasers of those most precious golf balls got together and as a body presented the twelve balls to Mr. Overbagh, and here Mr. Overbagh entered into his rôle as angel of the Red Cross, because hardly had the presentation been completed when up he jumped and asked, "Gentlemen, how much am I bid for these golf balls?" Friend Herstein lost no time in calling for eleven other members to form a syndicate of twelve to buy the balls at $10 each. Three times the number responded to the call, and the balls went to the Herstein syndicate for $120. Again they were presented to Mr. Overbagh, who immediately for the second time placed them on sale. Mr. Sackett duplicated Mr. Herstein's feat, and the Sackett syndicate bought in the balls. However, these wonderful balls were not going to stop there, and with an ability for keeping on rolling never before displayed by any other balls on the links or off them they kept moving.

A meeting called right on the floor carried a resolution to offer $150 for those golf balls in the name of the Dixie Club. Monopolies not being allowed under the Sherman law, the Erie Club rose to the occasion by also calling a meeting and raised the bid to $175. Friend Bernardin, sole representative of the Missouri River Club, shouldered the responsibility of raising the bid to $200 in the name of his club.

About this time the Dixie Club, having already splendidly supported its president in the Herstein syndicate, decided on a retirement for stategic reasons. President Bissell of the Lake Erie Club then took full possession of the balls through his club's bid of $250.

As a reward for offering a motion which added several hundred dollars more to the already large fund, Mr. Garron was finally presented with the twelve golf balls, but though apparently stowed securely all in that little box, those balls really kept right on rolling.

The question came up as to who should make the presentation to the young lady of Red Cross fame, and in the bidding that followed Brother Bernardin of Kansas City secured the privilege with the highest bid.

The following morning $1,510 was reported to have been collected. The news of the excellent collection had traveled quickly, and the proposed presentation of the money immediately took its place on the program for the day as being the most important event.

All the ladies wanted to be present and the manufacturers, though feeling rather slighted at not having been given a chance at the golf balls the night before, also condescended to be present. However, the fat bank rolls of some of the manufacturers had not been forgotten, and when the young lady was ready for the presentation, she also was ready with the golf balls, which had been once more donated for the Red Cross.

The first ball went at $50, and with final bids constantly going higher, the last ball was knocked down to its fortunate purchaser for the small sum of $202. In the brief auction the manufacturers had, through buying up the golf balls, raised $1,527 for the Red Cross. However, the jobbers present were not going to be outdone by any means, and within a few minutes after the total derived from the manufacturers' auction had been announced the jobbers had got together and raised $300 and some odd dollars more, making their total to the Red Cross fund upward of $1,800. Total funds secured by the means of those twelve golf balls were nearly $3,400, and if it had not been that other than golf balls are needed "over there" and electrical manufacturers and jobbers have an important mission in getting enough balls to the other side to bury the Kaiser, those golf balls would still be rolling and gathering in dollars for the greatest mother of us all—the American Red Cross.

GEORGE H. GUY'S SERVICE RECOGNIZED BY SOCIETY

New York Electrical Society Passes Resolutions in Recognition of the Thirty Years' Devoted Service of Mr. Guy

At the meeting of the New York Electrical Society on May 23 resolutions were passed as a recognition of the faithful and devoted service given by George H. Guy during his thirty years as secretary.

Engrossed resolutions passed by the nominating committee were presented by Edwin R. Katté, vice-president, to Mr. Guy. In these the committee sincerely and gratefully extended to Mr. Guy "our affectionate greetings and congratulations upon his long and faithful service, and our best wishes for the continuation of that service, and for his good health, his happiness and his prosperity."

A resolution proposed by T. C. Martin and seconded by Dr. C. O. Mailloux, senior past-presidents of the society, indorsing the sentiments expressed by the nominating committee, was passed.

The ticket for the coming year, nominated by the nominating committee, was announced as follows:

For president, A. L. Doremus.

For vice-presidents, Dr. E. G. Acheson, C. A. Benton, Philip Torchio.

For secretary, George H. Guy.

For treasurer, Thomas F. Honahan.

The following data are of interest as bearing on the fact that this is the banner year of the New York Electrical Society:

1. It has had during the year its largest membership increase, 519, bringing the aggregate membership up to 991.

2. The average attendance at its lectures has been 417, the highest but one of the twenty-two organizations in the Engineering Societies Building, and relatively to the membership the highest, and actually the highest of all electrical societies in the country. The whole of the eight meetings of the season have been devoted to war subjects.

3. The society has the largest bank balance it has ever had.

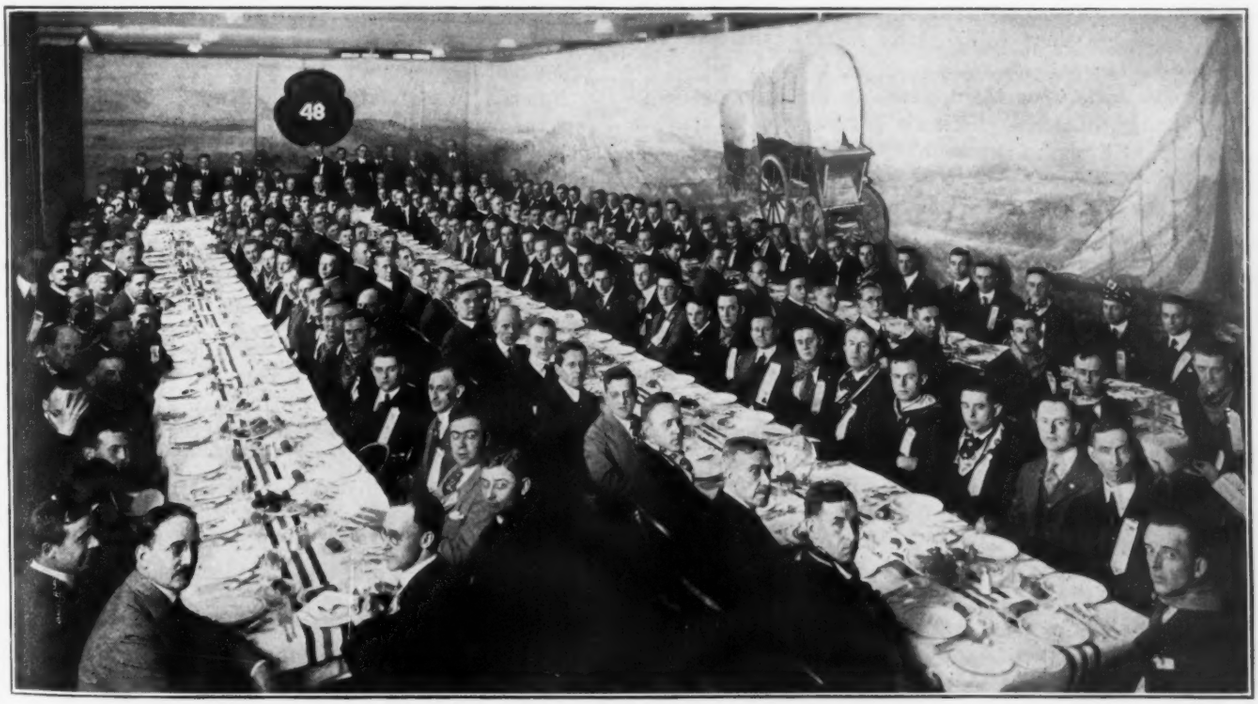
CONTROVERSY COVERING POWER DISTRIBUTION IN LOS ANGELES

Los Angeles Gas & Electric Corporation Seeks Injunction Against City to Prevent Construction Paralleling Existing Lines

The Los Angeles Gas & Electric Corporation has filed injunction proceedings against the city of Los Angeles seeking to prevent the municipality from paralleling the company's power lines. The complaint states that the plaintiff is adequately serving the districts affected and that the city has entered competition to sell, "at a profit and for a price no less, electricity no better."

This is contrary to the existing laws, the application states, since no permit for competitive service has been secured from the State Railroad Commission. The court is asked to enjoin the city from further work on the paralleling system.

Birthday Tribute to Henry L. Doherty



The president of the Cities Service Company, a guest at a banquet in honor of his forty-eighth birthday, Grand Central Palace, New York, on May 15, made two announcements to the 300 present. One was that Mr. Doherty and his partner, Frank W. Frueauff, had decided to create a securities fund, the income from which will be applied to scholarships for the sons of Doherty employees receiving salaries of $200 a month or less. The intention, broadly, is to put these junior Doherty men through college, and then by placing them in the various Doherty training schools prepare them to carry on the organization work. The other was the launching of a proposed Doherty fraternity.

THE ASSEMBLED DELEGATES TO THE DEL MONTE (CAL.) CONVENTION OF T PACIFIC

Public Policy on the Pacific Coast

Prompt and Efficient Action Necessary to Protect Utilities—Interconnection of Systems, Water-Power Legislation, Rates, Man-Power Reduction and Financial Help Are Immediate Problems

This gives some of the main points in the report of the public policy committee of the Pacific Coast Section of the National Electric Light Association. The report was presented by John A. Britton, chairman of the committee, at the meeting at Del Monte, Cal. on May 9 to 11. It is of timely and vital interest as a presentation of war problems.

TRUE to the traditions of old, the public utilities have, by their co-operative efforts with the government and its recognized agencies in all of the demands made upon them, given to the loyal people of the United States a different perspective in contemplating utilities as such, and it is strongly recommended by your committee that a bureau be established, to act in conjunction with national bodies organized for that purpose, looking to the distribution of a propaganda calling for a fair consideration of the rights of utilities, and that the old and time-worn spirit of antagonism be forever buried and forgotten, that the public may be brought to the realization that in these times of our troubles, common to all, the public utilities stand for all that the people stand for, and that under regulation the people are protected from profiteering by the utilities to a greater extent than the people are protected by the government regulation of all of the commercial industries and businesses; and we again pledge ourselves to that offer made at our last convention to the President of the United States.

Through the joint efforts of the Railroad Commission and the Fuel Administration there has been brought about in the State of California an interconnection of companies that it is safe to say could not have been accomplished otherwise than as a patriotic measure. It has thus afforded an appreciation of the economic advantages of centralization and unification and a great and potent saving of capital and of energy. The results of the bringing together of the companies are to be found in the records of the Railroad Commission and display in a very forceful manner the sacrifices that were made of individuality to accomplish the greater good to the nation.

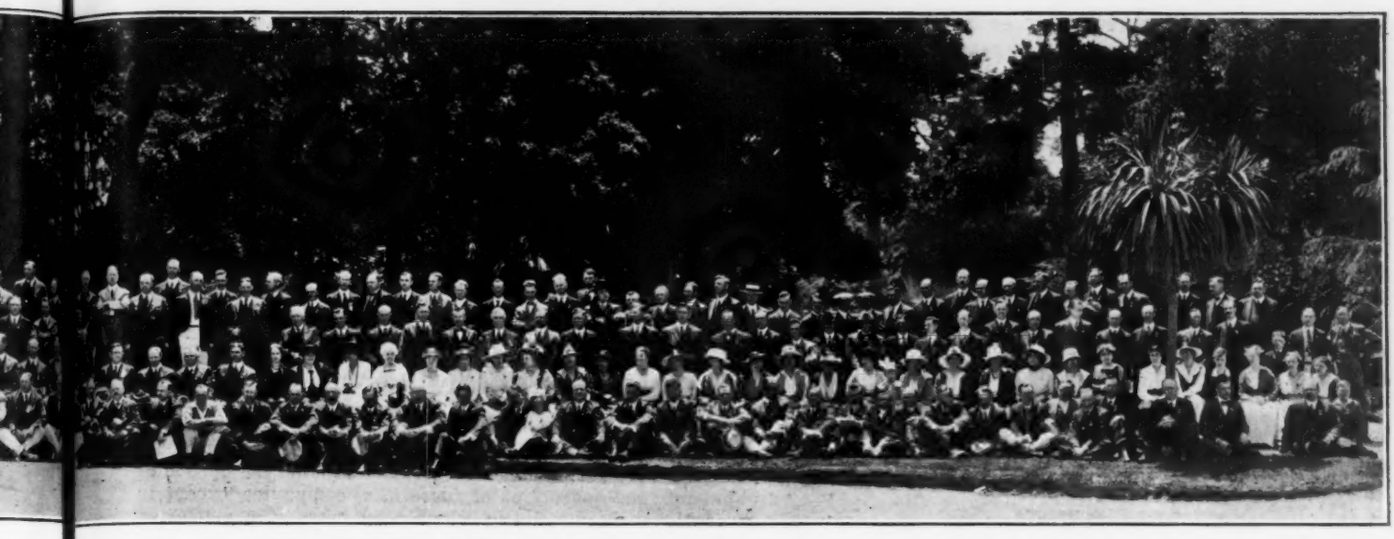
The Congress of the United States has now under consideration a bill for the leasing of public lands for power development. This bill, if enacted, will materially help to unlock the doors that for years have been locked and have kept away the maximum possible development.

Appeals to regulatory bodies were commenced during the year 1917 by companies which as long as it was possible forbore to apply for relief, anxious that their motives might not be misconstrued, and until it appeared that the capital invested in service to the public was facing absolute ruin if rates were not increased appeals for relief were not made. In most cases the increases granted on preliminary applications were largely temporary, as the rapid continued advances in price of labor and material could not be met by any action of rate-fixing authorities.

On the Pacific Coast the increased cost of oil has been the most potent factor in increasing the cost of service to public utilities. From October, 1916, to date, the base field price has risen from 35 cents per barrel to $1.23 per barrel, and this has been all the more severe upon the electrical operating companies by reason of the greater demand made upon them for service and the lessened hydroelectric output.

Few stop to think that if the service of the public utilities throughout the country should stop the whole war program would instantly collapse. It follows that in so far as the efficiency of a public utility is impaired the war program is proportionately delayed and interfered with.

Congressional help, an attempt to give which is made in the recent act of Congress, while affording some relief in refunding obligations, does not, because of the



PACIFIC COAST SECTION OF THE NATIONAL ELECTRIC LIGHT ASSOCIATION

short term of loans by the government and the added fact that loans must be made only for enterprises directly connected with governmental war activities, afford relief for permanent extensions to plants which cannot come into full earning power for years and which cannot be directly allocated to war-time activities.

The utilities must themselves take care of the future, and in no more certain way can this be accomplished than by being permitted to earn such return upon capital as will encourage the investor. At best the ability of the utilities to enlarge their facilities will during the progress of the war be reduced to a minimum unless this aid shall be forthcoming, and it is certain that without some constructive help from the state commissions there will be a curtailment of demands deemed to be purely essential in the furtherance of our nation's work.

We must find ways and means to meet these demands and prepare ourselves for the day that is to come when with the embargoes now existing removed there will be a forward movement toward the realization of the dream of a State busbar—yes, even a national one—as the most economical to serve the needs of the people.

Withdrawal of man power has proved to be the most serious handicap to the fullest economical administration and development of utilities, not only in the loss of such trained men but in the necessity for the substitution for them of men untrained and unfitted by contact and environment to take up the burden of those who have enlisted in the ranks.

This labor situation is one which we must face with the greatest concern, not only in the immediate present because of the withdrawal of the effective man power, but in the future, with the probability of never again approaching the degree of efficiency that heretofore has characterized organizations like ours.

Your committee fully believes that if the general public, always fair in its final conclusion, can be made to feel the true force and effect of the participation of utilities in the service of the government and their unquestioned patriotism, then when questions arise between the utility and public greater consideration will be shown than has heretofore been the case.

Aside from the giving of service by the depreciation of man power, the utilities have been called upon constantly to render aid and assistance to the various branches of the federal government. At no time has there been found lacking the necessary sacrifice of time and labor to make all of these governmental agencies effective, and the men of the public utilities have deemed it an honor to be classed as dollar-a-year men.

Perhaps one of the blessings in disguise due to the war has been the necessity brought home to the public utilities for economizing in all of their departments by the elimination of unnecessary operation and by reducing so far as they can, through automatic devices and otherwise, the necessity for man power.

The efforts made by the manufacturer, jobber and dealer at the last annual convention to secure recognition by the companies have been productive of results, and the trial now being given will demonstrate the effect of such co-operative work.

RESOLUTION ON WATER POWER

The following is the resolution reported by the public policy committee of the association on the water-power situation and adopted by the convention:

Whereas the future welfare of the public-land states depends upon water-power development to increase the location therein of industries to which cheap and constant power is a necessity and further to develop their agricultural possibilities; and

Whereas true conservation consists in saving that which is destructible, such as our forests and oil and coal deposits, and using that which is indestructible, our falling water, and

Whereas the immediate development of a potential power by water of not less than 100,000 hp. per year would bring arid lands into bearing, provoke the development of industries utilizing the hidden wealth of the public land states, and build up an empire in the West, and

Whereas the existing laws have prohibited the full development of the water-power of these States;

Now, therefore, be it resolved, that the Pacific Coast Section of the National Electric Light Association in convention assembled urges upon the Congress of the United States to enact at once such remedial legislation as will encourage development of the millions of horsepower now wasting to the seas, that true and not false conservation may prevail, and that the waste of fuels in generation of electric energy may be minimized:

Resolved further, that a copy of this resolution be forwarded by the president of this association to the President of the United States, to the Secretaries of War, the Navy and the Interior, and to Representative T. W. Sims.

POSITION OF DIRECTORS OF WAR FINANCE CORPORATION

Applications Are Made by Public Service Companies for Loans Amounting in the Aggregate to a Large Sum

Directors of the War Finance Corporation have authorized the statement that they have under consideration applications from many public service corporations doing business in various sections of the country for loans aggregating a large amount.

The directors of the War Finance Corporation do not feel that they have any authority under the law to make loans except upon adequate security, as required by the act, and they are convinced that the inability of a utility company to earn a sum at least sufficient to pay its fixed charges, taxes, maintenance and repairs is conclusive evidence of the inadequacy of its own obligation as security.

The directors of the corporation feel that the localities served by these various public-utility enterprises should not expect the War Finance Corporation to make advances to any utility company whose statement shows that it is in actual need of increased revenue. It is a matter for the local authorities to determine whether or not an increase in rates sufficient to maintain the enterprise as a going concern should be granted.

It is urged, therefore, that the proper authorities give prompt consideration to applications made by public utilities for permission to increase rates in order that the directors of the War Finance Corporation may know when applications for loans are presented by public utility corporations whether or not they will be able to give adequate security.

A supplemental statement indicated that the reference to increased rates was not intended to stop all negotiations for financing by such corporations. It is understood that the Capital Issues Committee and the War Finance Corporation will entertain propositions from public utilities companies and treat each application on its individual merits.

On May 28 the directors announced:

From the applications received by the War Finance Corporation there seems to be an impression in certain quarters that the corporation was specially designed to provide funds for meeting maturing obligations, particularly those of public utility companies. The law expressly provides that the corporation shall not make direct advances to provide funds to meet such maturing obligations, except possibly in some rare case which could clearly be brought within the "exceptional cases clause." Of course, the corporation will stand ready to lend its assistance to banks and bankers in proper cases where they have themselves made advances to war industries, whether for the purpose of meeting maturing obligations or otherwise, and direct advances in deserving cases that come clearly within the provisions of the law.

Holders of maturing obligations, whether of public utilities or of other concerns which may find themselves unable, because of temporary conditions, to meet their commitments punctually should consider whether, in the public interest, as well as their own, they should not co-operate by consenting to reasonable renewals. Public utility companies particularly, in co-operation with the communities in which they operate, should adapt themselves to the changed conditions brought about by the war.

No machinery has been specially provided for direct purchases of obligations of the public utilities, whether to meet maturities or otherwise, either through the War Finance Corporation or through any other governmental agency. The situation of these public utility companies is, therefore, quite different from that of the railroads, where Congress has made specific provision for the purchase of their securities by the government in certain exigencies, yet even the railroads are expected, wherever possible, to meet their own maturities and to pay what the money is worth to accomplish that end.

It must be remembered that the railroads are under federal operation, and that their rates are subject to federal control, and that the government therefore is in a position to see to it that their charges shall be sufficient to meet the cost of the service rendered. In the case of the public utilities, however, neither their operation nor their rates are subject to federal control. Wherever the charges do not amount to adequate compensation for the services rendered, relief can be had only through the appropriate local authorities, and time is essential to enable the companies and the communities in which they operate to reach a satisfactory solution of this important problem. It is not a problem which can be disposed of by having the federal government through the War Finance Corporation assume the burden of financing the operations of these local companies, except in exceptional circumstances which may make it a matter of national importance that advances should be made.

The local authorities will no doubt respond as promptly as possible in cases where relief is needed because of changed conditions, as it is clear that the soundness and efficiency of public utilities are intimately connected with a vigorous and successful prosecution of the war.

Directors of the War Finance Corporation on May 22 approved the first loan to be made under the authority conferred upon them by the act approved April 5, 1918. The loan, which was authorized after a hearing of representatives of those interested, is for $1,000,000, and will run for two years.

It will be made under Section 7 of the act, through two large banking institutions on the Pacific Coast, to the Northwestern Electric Company, Portland, Ore. The loan will be made on the notes of the bank, secured by first mortgage bonds of the company, supported by other collateral in accordance with the requirements of the act.

The additional power to be generated through the extensions and enlarged operations of the electric company will be used in connection with shipbuilding.

This loan being made through banks, the rate was fixed at 6 per cent per annum.

Applications for the issue of securities aggregating $478,458,386 were considered by the capital issues committee of the Federal Reserve Board. The committee's existence ceased upon the taking of office on May 17 of the Capital Issues Committee created by the War Finance Corporation act.

New issues approved reached an aggregate of $154,102,224. New issues for the same period last year were $504,211,624, so that a comparative saving has been effected of $350,109,399. This saving by action of the committee does not include the saving of $19,865,000 effected through informal postponement for the period of the war, secured through the efforts of the committee or its agencies. In addition, however, there is an immeasurable saving caused by the wide publicity given to the committee's aims and purposes, which has discouraged at the very source issues clearly incompatible with the national interest.

The committee attributes this success to the splendid co-operation and loyal support it has received from state and municipal authorities, departments of the federal government, the leading stock exchanges, the American Bankers' Association, and the Investment Bankers' Association of America.

Detailed report made by the committee is as follows:

	Municipal	Public Utility	Industrial
Number considered	192	62	107
Number approved	140	60	78
Number disapproved	34	2	24
Number curtailed	18		5
Amount considered	$86,878,512	$172,069,605	$219,510,269
Amount disapproved	19,791,665	6,000,000	39,900,000
Aggregate approved	$67,086,847	$166,069,605	$179,610,269
Less "refunding"	21,392,312	125,860,284	111,411,900
Aggregate new issues	$45,694,534	$40,209,321	$68,198,369
New issues last year, same period	108,952,865	107,504,075	287,754,684
Analysis of new issues approved:			
Amount original applications	$65,486,199	$46,209,321	$108,098,369
Amount approved	45,694,534	40,209,321	68,198,369
Curtailment effected	$19,791,665	$6,000,000	$39,900,000
Analysis of applications informally discouraged:			
Number	8	3	6
Amount	$8,915,000	$7,360,000	$3,590,000

OFFICIAL PRIORITY ORDER ON POWER IN ILLINOIS

Illinois Public Utilities Commission Takes Steps to Conserve Remaining Central-Station Power for Munition Manufacturing

In the case of the Central Illinois Light Company of Peoria before the Illinois Public Utilities Commission for temporary suspension of the rules governing free extension of electric service lines, the commission has taken rather interesting action. In the presentation of the testimony it appeared that the Central Illinois Light Company has ordered and expects to obtain additional equipment for its plant before the coming winter, but that such equipment if obtained will not provide sufficient reserve capacity to enable the company to meet adequately the demands which it anticipates for service.

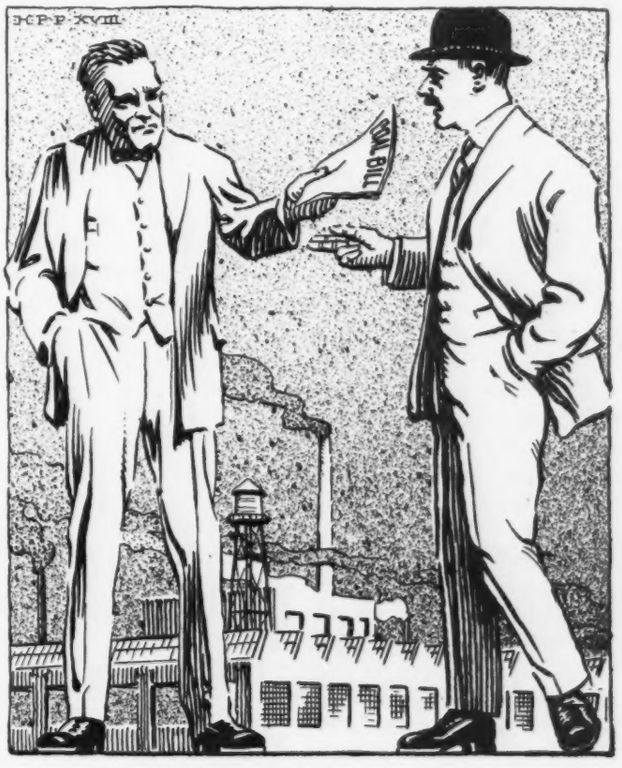
Under these conditions the company appears to be faced by the necessity of either refusing to supply those industries, which in its opinion are essential for the prosecution of the war, or of refusing to serve lighting customers, and it appears possible that in either event a discontinuance of certain portions of its service during the temporary periods of heavy loads may prove necessary. While the load which might be occasioned by additional lighting customers may not be a large proportion of the company's entire capacity, it certainly represents a large proportion of the capacity which is at the present time available for meeting the situation.

The commission, recognizing this situation, saw itself confronted with the problem of whether under these circumstances the needs of the war should be given precedence over the needs of private consumers, to whom the service represents only physical comfort which in most cases may be provided very nearly as well by other means. The commission took the position that, under the conditions existing in this case, ordinary patriotism demanded that the reasonable requirements looking toward the successful prosecution of the war should receive first consideration and that, following these demands, service required for private consumers should receive attention.

The commission therefore ordered the Central Illinois Light Company "to refuse to render electric service to additional consumers except as hereinafter provided without first securing the specific approval of the commission," and to "refuse additional service to existing consumers except in cases where the maximum demands of such additional service will be less than 10 per cent of the maximum demand at present being served," and ordered further that "such increases to the amount of 10 per cent to such consumers shall not be furnished at times more frequent than every six months. The Central Illinois Light Company may render power service, including incidental lighting, to new consumers, or increase without restriction the service rendered to existing customers (except residences, stores or offices) who are in classes exempted from the order of the United States Fuel Administration issued Jan. 17, 1918, and subsequent modifications and explanations thereof, and may render service to such other consumers as shall secure from the United States Fuel Administration, the United States Food Administration, the United States Department of War or the United States Department of the Navy a statement that the products which it purposes to manufacture are necessary for the successful prosecution of the war."

The commission also ordered the Central Illinois Light Company to get in touch with other nearby public utilities with a view to securing power for interconnection and to make a survey of isolated plants which might be tied in with the system. The company was also authorized to demand deposits from petitioners seeking extension of distribution circuits.

Winning the War



"Don't you like your bill?"

"It is not so large as it might have been. The government has prevented runaway prices."

"My friend, it is now your turn to do your part. Are you teaching your men to burn the coal efficiently?"

PLANS TO FURTHER THE CONSERVATION OF FUEL

Federal Fuel Administration Arrangements Include Moving-Picture Lessons, Official Bulletins and Constructive Engineering Assistance

In connection with its work in promoting fuel conservation the Federal Fuel Administration recommends that a board of competent engineers be attached to the conservation committee in each state; also a corps of lecturers to arouse public interest and disseminate engineering information.

The Fuel Administration has prepared a fifty-minute film of moving pictures showing good and bad operation in the steam-boiler plant, methods of testing boilers, fuels, etc. These pictures will be available for each state in connection with its educational propaganda.

The administration is also preparing a series of official bulletins on engineering phases of steam and fuel economies. Some of these are now ready for printing. They will include:

1. "Boiler and Furnace Testing."
2. "Flue-Gas Analysis."
3. "Saving Steam in Heating Systems."
4. "Boiler-Room Accounting Systems."
5. "Saving Steam and Fuel in Industrial Plants."
6. "Burning Fine Sizes of Anthracite."
7. "Boiler-Water Treatment."
8. "Oil Burning."
9. "Stoker Operation."

In addition to this service, a list of competent engineers has been prepared in Washington for each state and is available for use of each local administration. As the work develops, still further constructive assistance is contemplated for helping owners to bring their plants up to a high plane of operation with due attention to both economy and efficiency.

NATIONAL RESEARCH COUNCIL HAS PART IN WINNING WAR

At a Meeting of the Engineering Foundation Dr. George E. Hale Tells the Objects and Accomplishments of This Body of Scientists

That every feasible means of research will be used in all branches of industrial engineering and science in order that the war can be efficiently prosecuted was made clear by Dr. George E. Hale, chairman of the National Research Council, before the May 28 meeting of the Engineering Foundation in New York. The three primary objects of the council will be the advancement, promotion and utilization of industrial research. This work will be carried out by leading industrial, military and naval engineers.

The Research Information Committee has been established in Washington, London and Paris for securing, classifying and disseminating technical information. It will develop contact with research laboratories abroad and send in reports of advances in science and engineering.

The Research Council is made up of two main branches—one devoted to the physics and latent sciences and the other dealing with engineering problems. These branches are headed by very eminent men in the respective fields. The engineering division is subdivided into a number of committees each having its own particular field to cover.

Dr. Hale told of a few of the things that the council has done and of the important part that its study in geology, psychology, chemistry, facilitation of Patent Office work and assisting educational institutions has played. He told of a development made in nitrogen fixation by a student of the Massachusetts Institute of Technology that would reduce the cost of production considerably.

Dr. Hale commended the work of the Engineering Foundation and of the national engineering societies in establishing the Research Council on a war basis. He also read a letter sent to the council by President Wilson with reference to its work and the importance of its objects.

A HEATING APPLIANCE SECTION IS FORMED

Preliminary Meeting Held at Office of the Associated Manufacturers of Electrical Supplies, New York—Temporary Organization Effected

At a meeting at the office of the Associated Manufacturers of Electrical Supplies, New York, on Tuesday of this week manufacturers of heating appliances decided to form a Heating Appliance Section. The meeting was a preliminary one, and it will be followed by another at an early date at which permanent officers and committees will be elected.

F. D. Goode, Cutler-Hammer Manufacturing Company, presided as temporary chairman. Harry S. Mirrieless of Manning, Bowman & Company was temporary secretary.

SECTION MEETINGS OF THE ASSOCIATED MANUFACTURERS

Seven Sections Are to Meet at New London, Conn., from June 26 to 29—Board of Governors May Also Meet

Seven sections of the Associated Manufacturers of Electrical Supplies will meet at the Griswold Hotel, Eastern Point, New London, Conn., from June 26 to 29. The plan of holding the meetings in this way will greatly facilitate the work. The seven sections are:

Attachment Plug Section; chairman, H. W. Bliven, Harvey Hubbell, Inc.

Fuse Section; chairman, H. R. Sargent, General Electric Company.

Knife Switch Section; chairman, J. H. Trumbull, Trumbull Electric Manufacturing Company.

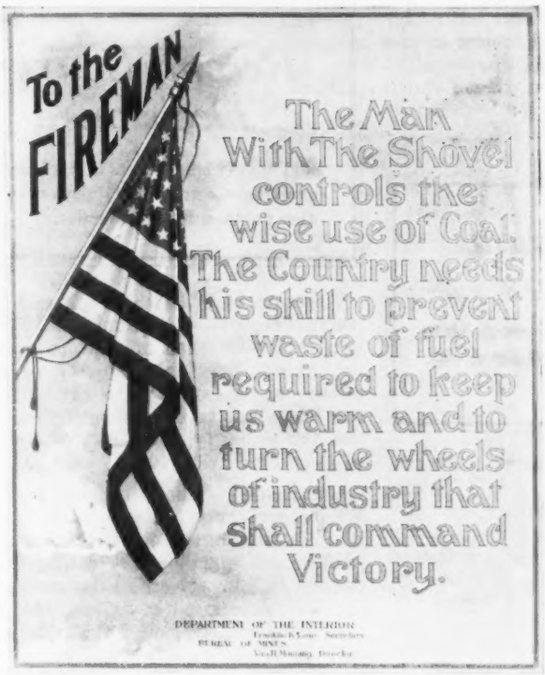
Lamp Receptacle and Socket Section; chairman, W. D. Steele, Benjamin Electric Manufacturing Company.

Outlet Box Section; chairman, F. W. Hall, Sprague Electric Works.

Panelboard and Switchboard Section; chairman, C. L. Eidlitz, Metropolitan Electric Manufacturing Company.

Snap Switch Section; chairman, E. Whitmore, Manhattan Electrical Supply Company.

The governors are much interested in these meetings and contemplate holding their June meeting during the same week and at New London. A large attendance is expected.


To the
FIREMAN
The Man With The Shovel controls the wise use of Coal. The Country needs his skill to prevent waste of fuel required to keep us warm and to turn the wheels of industry that shall command Victory.
DEPARTMENT OF THE INTERIOR

ARKANSAS UTILITY MEN HAVE PATRIOTIC MEETING

Food, Fuel, Red Cross and Thrift Stamp Activities Claim Precedence Over Papers on Technical Topics

Patriotism was the underlying theme of the eleventh annual convention of the Arkansas Association of Public Utility Operators at Hot Springs, Ark., May 21, 22, and 23. Ringing addresses were delivered by Hamp Williams, State Food Administrator; by J. F. Cristy, of the Jonesboro Water & Light Company, for the Fuel Administration; by George R. Wyant, assistant in the State distribution of thrift stamps; by Mayor J. W. McClendon of Hot Springs, and by George R. Belding, secretary of the Hot Springs Business Men's League.

The convention was not particularly well attended by operating men on account of the fact that in several of the principal centers of the State station loads have doubled in the last six months so that the efforts of every available man are required to maintain service. The realization of this situation caused the association to decide to postpone the convention, and notice to this effect was sent out about ten days before the date of the meeting. This notice was later countermanded by telegraph, however, owing to the storm of protest it developed from those who believed a convention should be held for the discussion of timely topics.

Among the technical papers and discussions the question of rate increases evoked greatest interest. A. Patterson of the Southwestern Gas & Electric Company summarized in a broad and general paper the situation in which operating costs are rising and revenues are remaining stationary. His paper was enthusiastically received. Discussion of it brought out that in Arkansas the fact that there is no commission makes the matter of advancing rates a local question in which each company has to be guided by local considerations.

Where a company has local existing franchise agreements which control rates it was thought best to give the rate increases which were being asked for as much as possible of frank and open publicity. Attention was also called to the advantage of asking for a surcharge on lighting schedules and straight increase on power schedules in cases where the proposed raise in rates is given great publicity in order to lessen curtailment of service.

The following methods of increasing revenue prior to asking for a general increase in rates were also brought out: (1) Elimination of special contracts made long ago at low rates; (2) checking meters; (3) rechecking maximum demands, and (4) adding a fuel clause to existing contracts. Those who took part in the discussion were E. T. Selig, Harrisburg, Pa.; L. C. Spake, Chicago; J. S. M. Wharton, Helena, Ark.; A. E. Murray, Malvern, and S. E. Dillon, Hot Springs. At a later discussion of the same topic C. J. Griffith, Little Rock, urged the operators not to be backward in putting before the local regulatory bodies or the public such demands for higher rates as are necessary to maintain the properties. He also summarized the recent financial troubles of the Little Rock company. It had $400,000 of gold notes coming due on Dec. 1, 1917. The financial situation made renewal of notes or receivership the only alternatives. Some additions were made to the issue so that the new loan amounted to $600,000. This cost the company $60,000. This is one of the reasons, he said, why the company is asking rate increases.

PROJECTED STATE UTILITY COMMISSION

The probability of Arkansas having a public utilities commission was also discussed. D. C. Green of Fort Smith said that it might be expected that either through a provision in the State's new constitution or by a special bill the Legislature would make provision for a commission at the session of the coming winter. He urged the central-station men to co-operate to get a public service commission law adaptable to the conditions of Arkansas and containing provisions for the indeterminate franchise and the certificate of convenience and necessity. The general sentiment of the convention seemed to favor commission rule rather than local regulation.

Other papers presented were on "Uniflow Engines," by F. M. Beeson of the Merkle Machinery Company, and on "Courtesy to Traveling Salesmen," by W. R. Herstein of Memphis, read by W. A. Munding of Memphis. These were not discussed.

Election of officers for the ensuing year resulted as follows: President, D. C. Green, Fort Smith; first vice-president, B. C. McKinnon, Eldorado; second vice-president, E. T. Leverett, Conway; secretary-treasurer, W. J. Thorp, Little Rock. The Class B members, the salesmen, elected as their officers: President, G. M. Ellis, district manager of the supply department of the General Electric Company, St. Louis; first vice-president, W. P. Holcombe, Maloney Electric Company, St. Louis; second vice-president, E. C. Brown, Ohio Brass Company; secretary-treasurer, C. C. Lewis, Columbia Lamp Division of the General Electric Company, St. Louis. The next convention will be held at Fort Smith.

A shorter name, the Arkansas Public Utilities Association, was adopted.

Associations and Societies

The Directory of Electrical Associations, which is regularly printed in the first issue of each month, appears on page 1171 of this number.

Independent Electrical Contractors' Association of Greater New York.—On July 13 the Independent Electrical Contractors' Association of Greater New York will hold its annual meeting at Mitchell Park and Hotel, Grant City, Staten Island. Representatives from all branches of the electrical industry are expected to be present.

Electric Club-Jovian League of Chicago.—At the May 23 meeting of the Electric Club-Jovian League of Chicago Phil A. Grau, member of the Chicago Association of Commerce and the United States Chamber of Commerce, gave a very interesting address on "American Business and the War." W. T. White and C. M. Converse of White & Converse, electrical jobbers of Minneapolis and St. Paul, were present and spoke of conditions in that section.

Joint Meeting of Engineers in Chicago.—A joint meeting of the Chicago Sections of the American Institute of Electrical Engineers, the Illuminating Engineering Society and the Electrical Section of the Western Society of Engineers was held on May 27. F. A. Vaughn of the Vaughn & Meyer Company, consulting engineers of Milwaukee, who designed the new street-lighting system in that city, gave an interesting description of the novel methods of distributing energy to the street lamps that were used.

Inventors' League of the United States, Inc.—In a discussion at a recent meeting of the Inventors' League of the United States, Inc., at New York it was brought out that the function of the league is not to sell patents except those placed in its hands for exhibition to inquirers, but is rather to advise inventors how to protect their interests in various ways, as, for example, by having contracts with capitalists interested in their invention properly drawn. It was pointed out that the inventor is really the best one to approach manufacturers in behalf of his invention as he is more familiar with its merits than any one else.

A. S. M. E. Annual Spring Meeting.—As previously announced in the ELECTRICAL WORLD, the spring meeting of the American Society of Mechanical Engineers will be held in Worcester, Mass., on June 4, 5 and 6. Among the important papers to be presented will be "Converting a Factory for Munition Manufacture," "Fire Protection," "Training Labor for Shipbuilding," and "Oil Fuel in New England Power Plants." "Efficiency of Gear Drives" will be presented by C. M. Allen and F. W. Roys. "Electric Heating Molds" will be discussed by Harold E. White, and A. A. Potter will deal with "Investigation of the Fuel Problem in the Middle West." The fuel conservation committee of the Engineering Council has arranged a practical discussion of fuel economy.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities.

War Conditions and Rate of Return.—A decision of the Illinois Public Utilities Commission affecting gas rates of the Monmouth Public Service Company says in part: "The commission is of the opinion that in matters involving rate increases of a temporary nature due to abnormal conditions such as now prevail because of the present war the amount prudently invested in a public utility property should be given the most serious consideration when determining reasonable rates, for upon such investment common justice demands a fair return. It must not, however, be understood that the public should bear all the burden of the increased costs of labor and materials, but only its just proportion, for in times of stress such as those now confronting us each should make some sacrifices for the general good, and to this a public service corporation is no exception. . . . It may be conceded that petitioner is entitled to a reasonable return upon the fair value of the property devoted to the public service. What this fair return may be will vary under different circumstances and will depend upon local financial conditions, the hazards connected with the business, the nature of the service and other factors of more or less importance in specific cases. This commission has heretofore taken the position that financial rewards in public utility enterprises should be commensurate with the ability displayed in their management, and rates of return approximating 7 per cent have been frequently permitted in cases wherein the stewardship appeared competent. In the case at bar the record discloses that normal ability has not been displayed in the management of petitioner's gas property and the standards of service have not been complied with, and to assume that mediocre stewardship is entitled to the same rewards as capable conduct of affairs is to enunciate a doctrine at variance with the sum of human experience and with principles well recognized in the business world. Therefore, taking into consideration all the facts disclosed by the evidence in this case and for the purpose of arriving at increased rates, the commission is of the opinion a fair rate of return upon the value of petitioner's gas property may be considered as 6½ per cent."

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies.

Assessment of Both Stock and Personal Property.—A municipality cannot, in the absence of express authority, assess personal property of telephone companies, it being the policy of the State not to assess both the stock and the property, the Court of Appeals of Maryland held (103 A. 133).

Contracts Without Time Limit.—Where contracts fixing a rate "unlimited" in time have been entered into by public service companies, the State has the right through the Public Service Commission, notwithstanding the contracts, to inquire into and adjust the rate to a reasonable basis, according to the Supreme Court of Pennsylvania (103 A. 287).

Condition of Premises.—Where unguarded wires carrying a high voltage of electricity were dangerous, it was negligent to leave them unguarded, if they were so placed that a reasonable man would anticipate that they would cause injury to one rightfully on the premises, according to the New York Supreme Court (169 N. Y. S. 984). In an action for injury to employee, invited to defendant's factory upon a business in which both defendant and employer were interested, because of a shock from wires, evidence held not to support a finding that defendant was negligent in not anticipating that injury might result from the condition of the wires, unguarded either by material construction or by providing sufficient warning.

Contract Rights Under Charter.—The law provides that any company organized to build dams or to construct and maintain canals, etc., to carry water to any plant or power house where electricity is generated or to erect and maintain lines to carry and transmit electricity, etc., may appropriate as much private land as is deemed necessary for its pipe, poles, tanks, reservoirs, etc., as well as land overflowed. It was held by the Supreme Court of the United States (38 S.C.R. 244) that a corporation organized under the general laws to construct and operate a power system acquired by its incorporation no contract right protected from impairment by Article I, Section 10, of the United States Constitution to have the quantity of water available for development by it undiminished. If a power company by eminent domain or otherwise acquires riparian lands or specific rights in the use and flow of water from riparian owners, these constitute property acquired under its charter, and not contract rights expressed or implied in the grant of the charter.

Men of the Industry

Changes in Personnel and Position—Biographical Notes

W. A. Layman, president of the Wagner Electric Manufacturing Company, has been chosen to serve on the board of directors of Washington University.

S. B. Matson, assistant sales manager for the Marron Electric Company, Rock Island, Ill., has resigned his position and has gone to New York to prepare for Y. M. C. A. service overseas.

J. H. Van Brunt, president-elect of the Missouri Association of Public Utilities, is vice-president and general

J. H. VAN BRUNT

manager of the St. Joseph (Mo.) Railway, Light, Heat & Power Company. He is a native of New Jersey. Twenty-nine years ago he purchased the street railway utilities in St. Joseph. Since that time he has been continuously in charge of that company and its operation in the street railway, light and power field.

J. E. Torrence, who has been manager of the Green (S. C.) branch of the Southern Public Utilities Company for the last five years, has resigned to enter the army.

W. E. Hewitt, formerly connected with the municipal light and water works of Douglasville, Ga., has been appointed superintendent of the municipal water and light plant at Sandersville, Ga., succeeding L. J. Porter.

C. H. Davis, general superintendent of the Marlboro (Mass.) Electric Company and manager of the Westboro (Mass.) Gas & Electric Company, has been appointed manager of the Westfield municipal gas and electric light works.

George W. Schmidt has been appointed chief engineer of the Northern Ohio Traction & Light Company's power plant at Akron. Mr. Schmidt began his career in the electrical industry in the mechanical department of the Union Electric Light & Power Company, St. Louis, where he remained for eight years. He was then appointed chief engineer of the power station of the company and served in that capacity for five and one-half years. Mr. Schmidt resigned from the company in St. Louis on March 1 to become connected with the Northern Ohio Traction & Light Company.

David W. Brunton of Colorado, who was chairman of the war committee of technical societies, the formation of which was initiated by the Engineering Council, has been elected a member of the Naval Consulting Board.

Prof. L. J. Corbett, head of the electrical engineering department of the University of Idaho, has been commissioned a captain in the Engineer Reserve Corps and is now stationed at Camp Lee, Va. Professor Corbett has been at the head of the electrical engineering department of the university for the past seven years.

R. M. Hodgson, formerly associated with the Philadelphia office of the General Electric Company, has been elected a director and the vice-president and general manager of the Binghamton (N. Y.) Light, Heat & Power Company, succeeding P. A. Staples, resigned. Mr. Hodgson has also been elected the second vice-president and general manager of the Sayre Electric Company and will be in full charge of the operation of both companies.

P. A. Staples, vice-president and general manager of the Binghamton (N. Y.) Light, Heat & Power Company and general manager of the Sayre Electric Company, has resigned to become associated with Lewis A. Riley, 2d, mechanical and gas engineer, 103 Park Avenue, New York City. Mr. Staples became manager of the Binghamton property late in 1916, having been a few months previously transferred from the Sandusky (Ohio) Gas & Electric Company, where he was a vice-president, to Dover, N. J., as vice-president and general manager of the New Jersey Power & Light Company.

M. C. Turpin, formerly assistant to the manager of the department of publicity, Westinghouse Electric & Manufacturing Company, has resigned to enter federal service as assistant to manager, Technical Publicity Bureau, Ordnance Department. Mr. Turpin's work will be on the dissemination of information from the War Department to manufacturers through the medium of the trade press. Mr. Turpin is a graduate of the Alabama Polytechnic Institute and of Cornell University. After several years' experience in the construction and operation of central-station plants he entered the Westinghouse department of publicity in 1909.

Samuel Kahn, president-elect of the Pacific Coast Section, N. E. L. A., is vice-president and general manager of the Western States Gas & Electric Company, Stockton, Cal. Mr. Kahn was born Oct. 18, 1882, at San Antonio, Tex. He received his early education at the San Antonio Public School and in 1898 entered the University of Texas, where he remained for two years, when he entered Purdue University, from which he was graduated in 1903 with the degree of bachelor of science from the School of Electrical Engineering. During the next six years he was engineer for the San Antonio Gas & Electric Company and the San Antonio Traction Company. From January, 1909, to May, 1911, he was

SAMUEL KAHN

general manager of the Union Light, Heat & Power Company of Fargo, N. D. In 1911 he became connected with the Appalachian Power Company, Bluefield, W. Va., as general manager, remaining until January, 1912, when he became assistant to vice-president of H. M. Byllesby & Company, with headquarters in Chicago and Tacoma, Wash. He continued this work until May, 1913, when he became vice-president and general manager of the Western States Gas & Electric Company, which position he has held continuously ever since.

Obituary

David Rankin Craig, who for some time conducted an electric supply business on Summer Street, Boston, died recently in his sixty-fourth year. Mr. Craig retired from business about nine years ago.

Edward Clarence Meier, president of the Heine Safety Boiler Company, died on May 7 at the age of forty-eight years. Mr. Meier was engaged from boyhood in the manufacture and sale of boilers. Upon the death in 1916 of his father, Col. E. D. Meier, who founded the Heine Safety Boiler Company, he became president of the company.

W. H. Carnahan, assistant treasurer of the Illinois Traction System, died at Champaign, Ill., May 18, at the age of sixty-two. He had been associated with William B. McKinley, president of that company, for forty years in various undertakings, and had been assistant treasurer of the Illinois Traction System and its component lighting and power companies for fifteen years.

TRADE & MARKET CONDITIONS

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies— Notes on Industrial Activities and Business Methods

DETAILED FIGURES OF ELECTRICAL EXPORTS

Canada Takes Largest Amount, with United Kingdom Second, France Third, Italy Fourth and Brazil Fifth

Detailed figures on electrical exports for the fiscal year ended June 30, 1917, are published for the first time on the opposite page. These figures, which were compiled by the Bureau of Foreign and Domestic Commerce, show the exports of electrical goods by principal items classified according to the countries of import.

A study of the table shows that Canada stood first in consumption of American electrical goods with a total of $9,926,311, United Kingdom (England, Ireland, Scotland) second with $7,200,634, France third with $4,244,252, Italy fourth with $3,268,307, and Brazil fifth with $2,351,210.

The total exports to South America were $8,292,571.

Out of total exports of $52,158,773, $26,404,077 went to the allied countries of Great Britain (including Canada), France, Italy and Japan. Less than 50 per cent went to the remaining countries of the world.

LIMITATIONS PLACED ON EXPORTS TO ALLIES

Boilers and Tubes, Copper Wire and Cable and Carbon Electrodes Come Under Latest Ruling of War Trade Board

The War Trade Board announces that for the purpose of preventing the useless consumption of materials and labor in making articles for export which for the present may not be exported, and for the purpose of saving tonnage by prohibiting the exportation of articles which have not been recommended by the government of the country of destination as being necessary for its essential requirements, the War Trade Board has adopted the following additional rules and regulations with respect to the issuance of licenses to export any commodity to the United Kingdom, France, Italy and Belgium (excluding their respective colonies, possessions and protectorates):

On and after May 15, 1918, applicants, before filing applications for licenses to export any commodity to the abovenamed countries, must obtain thereon the written approval of the mission in the United States of the country to which the exportation is to be made. To secure this approval applicants should forward their applications, duly executed in triplicate, with proper supplemental sheets attached thereto, including Supplemental Sheet X-11 or X-12, as may be required, to the British War Mission, Munsey Building, Washington, D. C., for shipments to the United Kingdom; the French High Commission, 1954 Columbia Road, N. W., Washington, D. C., for shipments to France; the Italian High Commission, 1712 New Hampshire Avenue, N. W., Washington, D. C., for shipments to Italy, and the Belgian Commission, Room 202, Council National Defense Building, Washington, D. C., for shipments to Belgium.

Applicants will be required to agree with the War Trade Board not to purchase or acquire for export or take any steps in the process of producing, manufacturing or fitting for export the articles specified in the application until an export license has been duly granted.

Shippers of articles contained on Schedule A will also be required to agree that, after export licenses have been issued, they will not make any purchase or acquire for export, or take any steps in the process of producing, manufacturing or fitting for export, the articles specified in the application unless they first obtain the written approval of the War Industries Board.

Included under schedule A, among other things, are asbestos, high-pressure steam boilers, carbon electrodes, copper wire and cable and boiler tubes.

THE GOVERNMENT IS NOW RECOGNIZING THE JOBBERS

Inability to Obtain Priority Orders for Stock Replenishment Is Proving a Source of Embarrassment

Six months ago the electric supply jobbers were considerably worried because the government was not giving them more recognition when placing orders. Orders were more generally placed direct with the manufacturer notwithstanding the existence of a nearer supply in some jobber's warehouse.

Recent events indicate that this situation has changed materially in the meantime and that the government now recognizes the worth and value of the jobber. The government is drawing more and more on jobbers' stocks. In some regions almost the entire jobbing trade is in war orders, a large part of which are directly government orders.

The shipyards, railroads and army and navy departments now appreciate the value of having available stocks close at hand without having to wait for shipments from manufacturers.

The one great difficulty that is met is in the question of priorities. Government contractors can requisition jobbers' supplies on priority orders. Jobbers, on the other hand, do not have recourse to priority orders to replenish their stocks. Priority orders can be secured by the jobber only on orders for which the purchaser has a priority.

This latter situation frequently proves to be embarrassing when the jobber must take the customer's priority to the manufacturer. Had the jobber been able to replenish his own stock through priority orders the frequency of such cases would undoubtedly be eliminated.

WAR ABSORBS THE ENTIRE OUTPUT OF METAL CONDUIT

Shipbuilding Takes More Pipe than Was Originally Anticipated—Factories Are Behind in Their Shipments

Metallic conduit and conduit fittings are now in such a position that it is impossible to obtain deliveries without showing that the material is required for a project necessary toward the successful waging of the war. Manufacturers in order to secure pipe must show the ultimate use of the conduit. It will therefore be impossible, one of the manufacturers stated to a representative of the ELECTRICAL WORLD, for a contractor or jobber to secure new pipe after the present supply is exhausted, except for industrial purposes or such other purposes as are definitely linked up with the war.

The available supply of pipe is by no means sufficient to take care of the market. The shipbuilding program of the United States has taken a very large amount of conduit, much larger in fact than was previously anticipated. Fac-

DETAILS OF ELECTRICAL EXPORTS FOR FISCAL YEAR ENDED JUNE 30, 1917

Countries	Batteries	Dynamos or Generators	Fans	Insulated Wire and Cables	Interior Wiring Supplies, Etc., Including Fixtures	Arc Lamps	Incandescent Lamps, Carbon Filament	Incandescent Lamps, Metal Filament	Meters and Other Measuring Instruments	Motors	Telegraph Instruments (Including Wireless Apparatus)	Telephones	Transformers	All Other
Europe:														
Austria-Hungary														
Azores and Madeira Islands		700	15	25				526					908	477
Belgium														
Denmark	6,800	1,504	127	32,928	3,700			138	621	8,954	16,717	24,767	240	63,560
Finland									75	263				12,535
France	32,383	159,877	107	1,964,546	40,386			8,406	2,001	387,204	2,000	34,807	29,075	1,583,460
Germany														
Gibraltar	210													2,014
Greece	1,894	225	1,345	260	660		284	6,982	378	2,350		600		22,723
Iceland and Faroe Islands	369	1,107		920	111									1,512
Italy	35,923	290,907	242	36,571	31,618		24	31,078	21,250	216,124	141,472	230,329	46,067	2,185,702
Malta, Gozo, etc														
Netherlands	4,008	2,197		124,319	1,897			60	1,386	18,299	2,550	2,416	1,035	77,943
Norway	28,925	168,812	591	463,314	11,640			311	1,834	73,605	5,106	88,307	46,619	824,484
Portugal	998	2,174	444	9,644	1,748			1,010	8,848	1,801	4,126	134	2,582	56,405
Roumania														
Russia in Europe	8,496	6,453	3,197	353,943	41,181	62		6,377	41,125	261,458	83	236,675	101,295	820,630
Serbia, Montenegro, etc														
Spain	13,703	106,998	3,183	234,003	17,962	2,002	372	8,600	47,568	205,215	1,749	29,196	38,594	444,383
Sweden	8,538	17,359		29,432	133				1,150	10,916				88,497
Switzerland				4,313	4,451					3,308				115,392
Turkey														
United Kingdom:														
England	861,117	62,787	21,084	755,385	51,533	244		14,413	29,778	533,808	86,090	50,979	13,173	4,561,103
Scotland	63,389	510		3,561	961		116	98	35	20,510	8,220		44	58,286
Ireland								65		1,304		766		1,275
North America:														
Bermuda	1,193	11	37	2,526	1,679	15		1,014	195	561	43	503	290	8,813
British Honduras	3,347	12,135		600	1,321		344	1,420	31	1,082	337	277	132	6,574
Canada	1,046,788	426,027	97,158	180,175	308,914	3,521	86,710	460,936	248,505	1,286,067	50,359	213,092	219,597	5,298,462
Central American States:														
Costa Rica	3,376	2,512	67	6,650	2,172		1,192	7,008	55	10,594	50	1,260	7,026	27,482
Guatemala	4,376	1,961	274	4,231	5,254		2,028	13,788	613	3,438	530	787	2,162	20,240
Honduras	6,839	1,355	316	4,176	1,107		319	4,905	527	7,557	5,250	2,517	2,570	26,675
Nicaragua	3,229	1,792		2,409	534		183	2,035	426	335	2,800	199	348	11,972
Panama	25,895	5,477	2,592	224,817	25,339	142	792	55,194	7,245	33,393	2,578	7,072	15,178	298,620
Salvador	1,918	726	374	16,727	5,498	743	3,546	11,110	215	5,546	78	1,688	11,809	29,243
Mexico	58,521	51,091	16,969	188,824	39,096	1,250	16,604	167,621	17,088	107,451	13,953	19,058	51,196	400,093
Miquelon, Langely, etc	798			120	27			70	115					682
Newfoundland and Labrador	24,061	4,658	181	24,220	5,514	127	937	23,419	2,474	18,538	10,380	1,754	4,273	63,004
West Indies:														
British:														
Barbados	1,508	905	7	1,338	122	93	171	369	4	387		2,050	51	5,278
Jamaica	5,471	852	607	6,613	1,641			1,750	24	3,643	425	1,323	141	16,815
Trinidad and Tobago	2,963	3,618	393	8,231	2,336		104	4,031	1,586	2,620	369	1,749	177	15,257
Other British	2,882	1,655	158	2,903	167		4	883	668	709	2	994		5,378
Cuba	144,300	228,653	23,590	495,005	116,100	2,603	10,245	272,668	71,865	289,483	14,508	189,895	103,252	980,599
Danish	319		257	4,623	114	194	25	256	515	421				774
Dominican Republic	4,396	5,363	201		3,556	100	157	10,549	1,933	4,233	1,512	5,943	1,320	36,344
Dutch	303		91	1,323	96			414		81		249	513	7,559
French	606	1,381		472	900		57	202	4	33			3	2,328
Haiti	1,201	5,893	29	1,563	497		685	2,702	13,861	437	100	883	1,079	5,084
South America:														
Argentina	81,330	23,855	30,374	222,318	61,537	402	6,987	215,756	157,820	103,840	5,081	27,572	24,503	760,252
Bolivia	648	89		3,346	489		67	2,455	272	5,702			1,157	13,647
Brazil	67,584	29,090	5,907	571,017	78,345	832	4,592	265,084	114,426	126,002	8,566	232,195	132,344	715,226
Chile	18,600	137,562	986	381,765	67,243	51	1,802	93,078	26,967	310,109	1,295	12,066	119,060	625,475
Colombia	11,744	16,616	1,361	42,232	8,918	35	765	40,710	2,317	22,600	12,259	20,031	11,210	116,688
Ecuador	3,163	7,731	1,481	10,932	5,645	823	4,643	6,665	3,371	12,178	285	20,508	1,711	32,672
Guiana:														
British	1,833	262	45	1,785	576	104	129	1,788	1,527	3,440		6,287		10,265
Dutch	343	100		823				55	2	95		76		811
French		2,705	96							50				225
Paraguay	30							234	682	83		152	2	558
Peru	9,605	53,181	586	76,847	10,382	361	8,223	21,437	6,416	50,062	751	8,037	36,227	143,464
Uruguay	14,622	5,548	25	65,148	13,736	61	372	53,759	9,300	12,516		2,345	1,976	91,188
Venezuela	20,758	11,496	339	32,924	7,876	160	39	29,862	1,565	20,621	227	8,592	7,710	102,972
Asia:														
Aden	35													
China	20,330	222,373	32,570	115,525	20,596		36	89,692	5,507	126,143	14,567	116,745	56,573	281,263
China, Leased Territory:														
Japanese		9,171	168	143					2,105	1,500		4,334	485	23,142
French														10
German														
Chosen	334	694		1,619	1,206			189	398	6,117		420	56	46,619
East Indies:														
British:														
British India	27,836	20,342	163,563	12,628	4,997			19,246	17,380	113,875	781	617	10,443	314,498
Straits Settlements	5,047	11,115	2,489	961	8,750		75	1,615	58	31,602				67,858
Other British	380	774	328		22			1,197		6,370		309		4,263
Dutch	23,947	10,749	1,175	206,586	1,325			2,280	3,158	9,052	2,680	28,508	15,009	98,664
Hongkong	439	1,135	22,083	1,010	1,193			4,210	10,749	14,762		42	3,023	16,839
Japan	7,816	245,164	8,015	23,661	27,571	347	736	3,728	48,054	195,188	26,331	148,383	10,885	1,018,694
Russia in Asia	117	66,163		4,270	25,202		795	3,074	10,338	298,567		9,851	34,912	390,525
Siam	5,117		4,517	3,956	2,477			1,212	387	4,244		3,338		17,613
Turkey in Asia														
Oceania:														
British:														
Australia	114,635	88,016	15,873	72,860	34,832	1,419	1,518	82,915	68,460	720,058	32	55,958	44,124	821,154
New Zealand	62,891	5,190	2,587	59,364	4,344	61	18	11,156	10,679	30,391	4,276	82,968	4,684	258,284
Other British	1,366	176		35						1,253				523
French	5,333	806	48	3,843	117		31	484	2	452	5	232	1,148	7,706
German	2,351			43						91				1,813
Philippine Islands	42,258	7,439	9,955	55,436	5,624		265	37,904	2,635	20,863	90,863	12,949	6,418	145,804
Africa:														
Belgian Congo												63		730
British Africa:														
West	72			1,054						5,723				3,089
South	45,782	3,406	2,905	28,303	960		1,421	24,867	9,307	97,372	1	601	41,050	203,758
East	602	400			358			5,725						3,213
Canary Islands	62				250				375					185
Egypt		5,471	1,540	1,399	56			2,880	894	14,600				2,935
French Africa								137		69				
Liberia														50
Portuguese Africa	593				66					2,452	3	4		6,431
Morocco												52		98
Entire globe	3,009,676	2,554,504	482,652	2,192,204	1,123,664	15,752	127,413	2,143,802	1,039,049	5,889,770	539,389	1,953,504	1,265,459	24,536,885

tories are behind in shipments, but find themselves in no position to better the situation at present.

A number of cars are known to be on their way to different sections of the country, but local stocks cannot be benefited except when embargoes are raised. In such cases a carload or two generally get in, but this does not satisfy the local demands. It does, however, ease up conditions.

This situation in conduit came as a result of the manufacturers in the iron and steel industry pledging their entire output to the service of the government and our allies so long as required. The direct and indirect requirements of the United States and its allies, it is stated, are equivalent to between six and eight months' production. As a result commercial iron and steel for the moment are receiving no attention. This situation, of course, will continue as long as 100 per cent of the production is necessary for war purposes.

THE AUTOMOBILE MARKET FOR ELECTRICAL GOODS

Demand for Second-Hand Cars Creates New Market with Increased Demand in Spite of Curtailed Car Production

The curtailment of pleasure automobile production is of considerable importance to the electrical trade. It was but a year and a half to two years ago that many electrical factories supplied their entire output to automobile manufacturers. Early in 1916 certain wire factories in the East were known to be working day and night on wire for pleasure automobiles.

Automobile lamps, wire, batteries, starting and lighting dynamos, instruments and wiring devices and accessories are purchased in large quantities for automobiles. However, the demand for electrical equipment for this purpose has by no means fallen off proportionately with the curtailment of new car production. In fact, there are indications of an increase. Owners of second-hand cars are creating a market. Second-hand cars are in much greater demand and therefore are bringing better prices to-day than ever before, and the demand for electrical starting and lighting equipment for used machines is growing rapidly.

It is well known that lamp manufacturers are having difficulty in keeping up with the demand for automobile lamps. Local stocks are low and there are many complaints regarding the difficulty in obtaining a supply.

Battery manufacturers state that the demand is being maintained. In fact, one of the large Eastern producers of storage batteries for automobiles states that the sales during the month of May have been phenomenal and that as a result the capacity of its plant is being taxed to the limit. In spite of all efforts to keep production up to the demand, this factory is finding that it is becoming more and more difficult to anticipate deliveries with reasonable accuracy. The total sales of this concern to date far exceed those of the first five months of 1917.

MOVEMENT FOR ADOPTION OF A NATIONAL TRADEMARK

A Bill Now Before Congress Is Aimed to Defeat Piratical Methods of Local Merchants in Foreign Markets

A movement is on foot toward the adoption of a national trademark. A bill on this matter is now before Congress. The need for such a designation of American-made goods in foreign markets is owing to the "piracy of private trade in foreign markets," according to Chauncey P. Carter of the Bureau of Foreign and Domestic Commerce, who had an important part in drafting the bill.

American trademarks are frequently registered in a foreign market by some local merchant before the American goods are placed in that market. The American merchant then finds his own trademark useless, so far as he is concerned, in that country.

"If we had a national trademark, owned and protected by our government, this American manufacturer," said Mr. Carter, "could outwit the pirate merchant by merely substituting the national trademark for his private mark on all shipments to that country."

COMMERCIAL BRIBERY MAY BECOME CRIMINAL OFFENSE

The Federal Trade Commission Urges Enactment of Law in Order to Preserve Free and Open Competition

The Federal Trade Commission has recently sent to both branches of Congress a communication urging "the enactment in the public interest, as an aid to the preservation of fair and free competition, a sufficient law striking at the unjustifiable and vicious practices of commercial bribery and that such law be so comprehensive as to strike at each person participating in any such transactions."

The Federal Trade Commission has found commercial bribery to be general throughout many branches of industry, and scores of complaints have been issued by it on that account. Fourteen states at present have laws prohibiting such practices, but they fail to reach the root of the evil and eradicate it—in fact, they are practically dead letters. The commission can only deal with commercial bribery as an unfair method of competition, having no criminal jurisdiction, and can deal only with one side, having no power to reach the receiver.

In its communication to Congress the commission states that it "has made considerable investigation of bribery of employees of customers as a method of securing trade. These bribes take the form of commissions for alleged services, of money and gratuities and entertainments of various sorts, and of loans—all intended to influence such employees in the choice of materials. It is evident that this inexcusable added cost is finally passed on to the consumers.

"Corrupt employees having the power to spoil and disapprove materials have been able to bid one salesman against another until in many cases they have extorted secret commissions, so-called, as large as 20 per cent of the value of the goods sold.

"In order to prevent a resort to a common method of corruption, it is recommended that the law should also prohibit the giving of any such gifts or other considerations to members of the agent's or employee's family, or to any other person for his use or benefit, direct or indirect."

WIRE UNAFFECTED BECAUSE OF RUBBER IMPORT RESTRICTIONS

Electrical Manufacturers Consulted by Government in Advance of Order Limiting Incoming Supply of Crude Materials

An order from the War Trade Board limiting the importation of crude rubber from overseas to a total of 25,000 tons from May 6 to July 31 is apparently not creating any discernible disturbance or concern with electrical goods manufacturers using this material in their finished products. Several leading producers of rubber-covered wire and cable, rubber insulators, etc., when asked if this action would curtail their output or have a tendency to increase prices, said that with the exception of rubber insulators, due to be advanced any day, no trouble was anticipated unless the restricted period was extended longer or indefinitely. Then there would be reason for anxiety.

Wire and cable manufacturers frankly state that rubber had been plentiful and cheap, and every company of any standing had certainly a three months' or more reserve stock of crude rubber on hand. In fact, it is reported that electrical goods producers had been consulted by the government regarding their supply of rubber before the action was taken. Therefore no one would be hampered or have legitimate or trade output lessened in any measurable degree. It is recognized that tonnage is needed more pressingly in the prosecution of the war. Consequently no objection or harsh criticism is voiced.

The War Trade Board said in its notification that the "requirements for the production of goods for the United States and allied governments will be met in full. The remainder of the 25,000 tons will be allocated among the manufacturers of rubber products on the basis of their consumption in 1917."

Crude-rubber importers, on the contrary, are in a different frame of mind. A leading concern that has important dealings in crude rubber with the electrical trade was very much perturbed over the situation. The War Trade Board had sent out a questionnaire to the 175 importers of crude rubber, to which 174 responded. It was thus ascertained that on March 31 there were on order or in store 11,224 tons; engaged abroad or en route, 20,754 tons, with a further lot of 14,800 owned by Americans and intended for this market, making a total of 46,778 tons. It was further stated by this importer, who seemed to represent the sentiment of his branch of the business, that the annual (1917) consumption of crude rubber in this country was 169,000 tons. He therefore figured that the 46,000 odd tons in sight in no way could supply the normal demand.

The price of crude rubber established by the government May 8 is 68 cents a pound for upper refined, 63 cents a pound for first late (first milk), 62 cents a pound for red smoke sheets. The producers of electrical goods use all three grades in liberal quantities. Seven years ago Para rubber sold for $3.85 a pound.

METAL MARKET SITUATION

Copper Stays at 23½ Cents and Zinc Prices Are Fixed Until Next September

As was foreshadowed in this department, the price of copper remains undisturbed. The price-fixing committee of the War Industries Board on May 23 recommended that 23.50 cents a pound in car lots and 24.75 cents a pound, the jobber's price to small consumers, be continued for seventy-five days. This period, which carries it up to August 15, was a slight concession only to the refiners and producers of the metal. The government was evidently satisfied that the profits accruing to the primary handlers of copper were sufficient. It is an open question now, outside of other considerations, whether wire products will be marked up, as was predicted. This advance was predicted on the so-called "sure thing" tip on the governmental increase in the price of copper. Tin is easier.

President Wilson last Saturday fixed the price of zinc for a period until next September as follows: Grade A—12 cents; freight free on board plant, 14 cents; sheet free on board plant, 15 cents. The prices are subject to the usual trade discounts and differentials in effect on Feb. 13 last.

The price was fixed under an agreement with the industry by which producers will not reduce wages. It will be the same for the public, the Allies and the government. The War Industries Board will direct distribution to prevent zinc from falling into the hands of speculators. Producers pledged themselves to exert every effort to keep up production and insure an adequate supply.

NEW YORK METAL MARKET PRICES

	May 20	May 27
Copper:	£ s d	£ s d
London, standard spot	110 0 0	110 0 0
	Cents per Pound	Cents per Pound
Prime Lake	Govt. price 23.50	Govt. price 23.50
Electrolytic	Govt. price 23.50	Govt. price 23.50
Casting	Govt. price 23.50	Govt. price 23.50
Wire base	26.25 to 26.75	26.25 to 26.75
Lead, trust price	7.00	7.00
Nickel, ingot	40.00	40.00
Sheet zinc, f.o.b. smelter	Govt. price 15.00	Govt. price 15.00
Spelter, spot	7.50	7.35 to 7.45
Tin, Chinese*	$1.03	$1.02
Aluminum, 98 to 99 per cent.	Govt. price †32.10	Govt. price †32.10

OLD METALS

	Cents per Pound	Cents per Pound
Heavy copper and wire	21.50 to 22.00	21.50 to 22.00
Brass, heavy	13.50 to 13.75	13.50 to 13.75
Brass, light	10.50 to 11.00	10.50 to 11.00
Lead, heavy	6.00 to 6.25	6.00 to 6.25
Zinc, old scrap	5.25 to 5.75	5.50 to 5.75

*No Straits offering. †In 50-ton lots; carloads, 32.10 cents per lb.; 10-ton to 14-ton lots, 32.20 cents per lb.

THE WEEK IN TRADE

WEEKLY it becomes more and more evident the extent to which the electrical trade is engaged in a war business. Purchases by the utilities are almost at a standstill. Contractors have little to do in the customary channels. New markets, such as shipyards and cantonments, are being opened and are assuming large proportions. New building is large, but it is of a character different from peace times. Shipyards, docks, army depots, arsenals, factories, etc.—these are the high spots of the building market, and the money being invested therein is running into unusually large figures. The demand for electrical goods is naturally keeping pace with this program. Priority orders are now the rule at the factories. Ordinary commercial business is fast disappearing. Even in such an article as fans it now appears that the government is going to become the dominant influence in the market.

Deliveries to government contractors are reported to be getting very much better. No such reports, however, are forthcoming from commercial customers.

Higher prices of 10 per cent on wiring material are the noticeable feature of the week. Other price advances occurred locally.

Further indications of price fixation were revealed a few days ago in the announcement of the government prices on zinc. Indications are that copper will remain for the time being at 23½ cents in spite of an attempt to obtain more.

With the draft board "work or fight" announcement this week labor supply in the useful industries, which include practically all electrical manufactures, ought to become more plentiful. As a result there should be fewer idle manufacturing facilities and somewhat increased production.

NEW YORK

Jobbers and distributers in this territory report a very satisfactory volume of business for the past week. Some concern is being expressed regarding future stock of staples. Factories have their order books pretty well filled for the entire line of electric requisites, and a suggestion of overbuying is derived from a look over the items filed. Under current conditions manufacturers are inclined to scale down the requisitions of some jobbers who are evidently endeavoring to get in their warehouses stocks greatly in excess of their normal requirements. Prices remain unchanged in nearly all lines. Deliveries are poor and uncertain.

Collections are said to be very satisfactory. Credit accommodations are gingerly accorded, particularly on new accounts.

SMALL MOTORS.—Fractional motors are by no means in strong supply. Manufacturers are several weeks behind on orders. The demand is and has been unusually active. No change in prices.

LAMPS.—Notwithstanding the heavy requisitions for standard sizes—beyond the most sanguine estimates of the manufacturers on government orders—the lamp producers are rapidly accumulating stock against future business. Orders are carefully scrutinized, however, and if jobbers are figuring on acquiring surplus stock against speculative contingencies they will be greatly disappointed. Only the regular requirements, beyond providing for a normal expansion of business, will be accepted. Deliveries are fair, with six weeks as the average shipping date. One order for 10,000 "mushroom" lamps was promptly turned down by a manufacturer on account of its peculiar specifications.

CONDUIT.—The market shows no marked improvement. Shipments from Pittsburgh and Youngstown, Ohio, factories dribble in by one and two car loads from time to time,

but no dependence can be placed on these arrivals when dates are considered. The demand is steady, jobbers and dealers exerting every effort to supply the consumer, whose impatience is gradually subsiding as manufacturing and shipping conditions become known.

HOUSEHOLD SPECIALTIES.—The movement of sewing and washing machines, ironers and tableware is brisk. Manufacturers are still behind on deliveries—about three weeks on the Western schedule. Prices are unchanged.

FLOODLAMPS.—On the larger sizes the factories are yet behind on filling orders, some of which represent sales of some magnitude. These are for government use, direct or indirect. Sixty days is about the delivery time on these goods. Some munition plants are sending orders for special colored glass. These the manufacturers would rather "pass up," but, being for war purposes, they are accepted with the best grace possible and promptly delivered.

CREDITS AND COLLECTIONS.—Collections have picked up at least 10 per cent during the past week. The "slow pays" are among the regulars, but being sound and above criticism no anxiety is expressed. Credits are held close to a straight line.

INSULATING TAPES.—The high price of cotton is affecting the cost of tapes. During the past year four advances were made, the latest of 10 per cent occurring a month ago. Varnish, oils, etc., used on cambric tapes are going up, and there is a possibility of another jump in price.

DRY BATTERIES.—A steady demand is reported, with the factories about even on filling orders and deliveries. Prices are stationary.

CHICAGO

The record of jobbers' sales for the first four months of 1918 shows a volume of business practically equal to that for the same period of 1917. There is some evidence, however, that some of this business has been due to unfilled orders carried over from last year and early in 1918. In the southwest portion of the Chicago district jobbers report a decrease in inquiries due to the government's attitude toward the expenditure of capital for even such purposes as small municipal lighting plants. From many sources are heard predictions of still higher prices. News that the United States steel gun plant is to be located in the Pittsburgh district gives promise of some business for the Central West soon. The one large central-station construction job in the Middle West now is the new station of the Kansas City Light & Power Company, to cost $8,500,000. This work is still in the hands of the foundation builders. The only electrical work in progress is the underground system from the power station to distribution plants.

BOSTON

Business has been well maintained during the week, and credits are in pretty good shape. The central stations are doing a vast amount of war service work, and the industrial plants are constantly being mobilized for needs relating to military or naval activity. Good progress is being made on the government construction programs in this district, and many sales of electrical material to Uncle Sam are registered daily. The labor supply is getting scarcer and is causing jobbers, dealers, manufacturers and contractors no small amount of worry. Transportation conditions show some improvement, but emphasis is being laid by the railroads upon the vital importance of prompt unloading of cars as a war measure. Since winter there has been a slacking off in this which is making trouble. Prices of wiring materials advanced from 5 to 10 per cent last week because of the high cost of labor and porcelain. A vigorous coal-saving campaign is on in New England in anticipation of serious conditions next winter.

APPLIANCES.—Portable lamps and fixtures are very quiet at present, but there is a good market for flashlamps, dry cells, irons and wedding gifts. Some excellent displays of high-class tableware and smaller cooking devices are being featured in appliance showrooms.

FANS.—The rush movement of fans has not yet started among retailers, but any day is likely to bring heavy sales. Stocks are well prepared for eventualities, and liberal buying is anticipated from both industrial and residential users.

INDUSTRIAL ELECTRIC TRUCKS.—Purchases for government or related service are the feature of the market. Prices are firm and deliveries fairly good, considering railroad and raw material conditions. Minor development work is occasionally put through by manufacturers.

LAMPS.—Complaints regarding shortage of lamps are now seldom heard. The use of electric signs appears to be on the increase, but the reduction from last year's service is so marked that stocks do not appear to be suffering to any great extent.

WIRING MATERIAL.—Factory stocks are lower than normally, and little chance to build these up is noted. Very heavy government orders are being handled. Export business is developing under intelligent management. Labor is very scarce as regards fresh and reliable supplies. Porcelain shipments into the factories are now being handled to advantage in some cases by motor trucks instead of by rail, and it is reported that through the scheme of providing a return load for each truck costs are much lower than at first was anticipated.

MOTORS.—Not much change appears in the motor market. Prices are firm, and deliveries, while better on smaller sizes and standard types, show much to be desired in the larger units.

CENTRAL-STATION TESTING MATERIAL.—The domestic market is dull, though some inquiries are still coming in. There seems to be an opportunity here for some manufacturers, at least, to tie up with special government work.

ATLANTA

The volume of business in all lines is generally heavy. Although the sales in irons and heating devices have fallen off, these are offset by increases in other seasonal lines. The paucity of labor is becoming serious. Especially is this true for the unskilled class. The urgent demand by the government for unskilled labor at the coastal cities, together with the high rate of $3.85 a day, has for the time stripped this section of the fill-in or floating element that has been available during the last few months. A general contract has been awarded by the War Department for the expenditure of $25,000,000 at Charleston, S. C., covering the construction of warehouses, ammunition depots and terminal facilities.

CREDITS AND COLLECTIONS.—Information at hand indicates that jobbers are utilizing the trade acceptance more than ever, especially for sales made to outlying dealers. Jobbers' collections are not up to the standard of the last few months and a tight rein is being held. The contractors are not discounting bills as they did some time ago. There is very little change in the condition of manufacturers' collections, which have been maintaining a good record.

CONDUIT.—Both black and white rigid in sizes of ¾ in. and 1 in. is becoming very scarce. Local stocks are in worse shape than they have been in some time, and no immediate relief is in sight, with the exception of sales made for government purposes, which can be replaced through priority orders.

WIRING DEVICES.—Usual schedule material has advanced 10 per cent within the last week.

WIRE.—Rubber and weatherproof wire have also taken a jump of approximately 10 per cent.

FANS.—While a fan shortage is probable, replies to inquiries made to the jobbers apparently reflect the impression made by Eastern trade opinion. So far there is no visible shortage in this section. The season, however, is advancing slowly, and it is very hard to secure definite information on the local situation.

MOTORS.—A general advance of 10 per cent in the price of motors was registered, beginning the 18th. Isolated heavy buying tends to hold the volume of sales up to the figures of the last few months, but the uniform demand has

slackened perceptibly. Some improvement is noted in shipment promises of the larger ratings.

CHARGING OUTFITS.—Manufacturers and jobbers report an excellent business and increasing volume of sales. One manufacturer states that the sale of outfits in the Southwest is well up with the volume of business being transacted in the more populous northern sections of the country. Shipments are very satisfactory in comparison with other lines.

SEATTLE

General business conditions continue highly satisfactory according to both wholesalers and retailers. Business is as usual, in spite of the second Red Cross fund drive, in which Seattle territory more than doubled its allotment. Sales to shipyards and domestic sales maintained former high levels, although no particularly large sales were recorded. Further large power apparatus and equipment are anticipated in the near future from Tacoma, Gray's Harbor and Columbia River shipyards to care for projected improvements and enlargements. The market for large generators and larger-sized motors was comparatively dull during the past ten days. Schedule materials, wiring devices, wire, conduit, etc., used extensively by the government at the navy yard and cantonments and at shipyards, are going rapidly. Conduit especially is being turned over as fast as it comes in. Shipments are coming through more slowly, and the stock shortage promises to be acute unless promised shipments arrive. A slight increase in price on wiring devices was noted during the past week.

Possibility of receiving L. C. L. shipments in anything approaching satisfactory time is exceedingly remote. This condition applies to shipments within the State and Northwest as well as from the East. Cases are reported of two and three weeks consumed in receiving shipments from Seattle to Spokane across the State.

Construction immediately of new shipyards and enlargements to established plants indefinitely mentioned heretofore were announced last week. The Northwest Steel Company, Portland, will build an auxiliary steel yard covering 40 acres—four ways. A firm recently closed contracts with the Emergency Fleet Corporation for eight 8800-ton steel ships. The Hefferman Drydock Company, Seattle, plans the immediate establishment of a dry dock, machine, plate and blacksmith shops and outfitting wharves in Seattle. The Pacific Coast Steel Company, Seattle and Portland offices, will establish a five-hundred-thousand-dollar open-hearth furnace and rolling mill in Portland. The plant will have a capacity of 4000 tons per month. The Standard Concrete Shipbuilding Company will build a concrete ship plant near Tacoma. Active construction is promised immediately. Contracts for three scout cruisers and seven merchant ships have been transferred to the Todd shipbuilding plant, Tacoma. The division of transportation, Emergency Fleet Corporation, which looks after transportation of machinery, materials and supplies for steel and wooden shipbuilding, has opened offices in Portland. A residential construction program has been announced by the government for the navy yard at Bremerton, Wash., involving an initial expenditure of $2,500,000 and ultimately $5,000,000. One hundred and seventy-five acres have been commandeered, on which will be built 350 houses, two apartments and a 400-room hotel.

Unusual ice conditions in Bering Sea reported in dispatches from the north will necessarily delay shipments of electrical equipment and power apparatus to mines.

Mill and cannery shipments are being rushed to southeastern Alaska points, where they will be relayed into the interior. The acute labor shortage may be further aggravated by the administration's recent order that all men of registration age must work or fight. Shortages in shipyards, mills and factories allied in war work will be relieved, but other lines of business will be left in dire straits.

The supply of lamps in smaller sizes is slowly increasing with approach of summer. A shortage still exists in larger sizes, and automobile lamps are almost impossible to obtain. The demand for the latter is heavy. Flashlamp sales continue excellent, although sales are lighter with passing weeks.

SAN FRANCISCO

The electrical business showed no abnormal features last week, barring some excellent orders for wiring equipment for shipbuilding plants and several big pole orders.

Three steel grain elevators are to be erected in Knight's Landing, big bean-cleaning plants in Sutter and Yolo Counties, and the Union Construction Company is planning the erection of several plate shops in its Oakland Front shipyards. A reflection of the vast commerce with the Orient lies in the report that negotiations are under way by the Toyo Kisen Kaisha Steamship Company for the erection of a six-story office building in San Francisco. An unusual building item among the non-standard items for shipyards and packing plants is the proposed hundred-million-dollar addition to the "White House," one of San Francisco's largest department stores.

A group of Oroville men have announced plans for the erection of a new power-plant project on the Feather River, California, at an estimated cost of $7,500,000, and the congressional commission appointed to finance industries considered essential to the conduct of the war will be asked to consider it. The plan calls for the construction of a dam 1160 ft. long and 650 ft. high to make a reservoir out of Bald Rock Canyon, giving a total of 1750 ft. capable of developing 166,000 hp.

It is announced that Vallejo will be furnished with a modern street-lighting electrolier system within the present year, and that the city engineers of Fresno will ask for alternate bids for such a system as supplied with cast-iron or concrete poles; that Red Bluff is ready to construct the first six-thousand-dollar unit of such a system, and that the town of La Habra in southern California will be thus equipped.

LAMPS.—Deliveries have slightly slackened during the past week or so. Sales are fine, agents are in good shape, and the business is in excellent condition.

MINIATURE LAMPS.—There are plenty of flashlight lamps, but the embarrassing shortage of automobile lamps still continues. Until new factories are built to cope with this ever-increasing demand, it will be impossible to fill stock orders, the manufacturers realizing that automobile manufacturers must be given preference.

FARM PLANTS.—The sale of farm lighting plants continues better and better, and it is announced that new improved plants with automatic regulation will soon be on the market. The excellent crop prospects will influence many sales for the fall, and the missionary work now being done in addition to present sales will then bear fruit.

TELEGRAPH MATERIAL.—A considerable call is reported for small relays and sounders, and especially for learners' telegraph instruments, due no doubt to the big demand for railroad dispatchers, and especially for radio operators for the navy. All the new vessels now being built for the Emergency Fleet Corporation will require new operators, and a proportionate number of operators must be secured for our ever-increasing navy. These instruments are used for practice by boys and men with such ambitions.

DISHWASHERS.—Although dishwashers have been sold in this district for at least three years past, the demand since the first of the year due to the shortage of household help is easily 1000 per cent over all previous calls. Deliveries are poor.

WASHING MACHINES.—The most popular article of sale just now is the washing machine, which can be had only in small sizes and in dolly styles. Machines of a size for average families are scarce, with no immediate prospect of better conditions. One manufacturer states that he is 3000 machines behind on this standard family size alone. Prices advanced about 10 per cent during the last of April, but this has not influenced sales one bit.

IRONING MACHINES.—The latest labor-saving electrical household device to come into its own is the electric ironing machine. Two prominent makes are being sold on the Pacific Coast and, as the sales reach considerable volume and require time payments by dealers, the representing jobbers are considering a form of financial assistance to them on such sales. The average household size complete with motor sells for about $110 f.o.b. Pacific Coast.

Current Prices of Electrical Supplies

New York and Chicago Quotations

THE prices quoted are those prevailing in standard packages of specified lots on apparatus and appliances in Eastern and Middle West markets at the beginning of business on Monday of this week. They are in all cases the net prices or prices subject to discounts from standard lists of contractors, central stations, dealers and others engaged in the resale of such goods.

Prices in Southern and other nearby markets will rule about the same as those in the Middle West, although slight modifications to cover increased freight and local demands should be expected. In the Far West and on the Pacific Coast the prevailing prices are naturally higher, covering as they must increased freight and the necessity of larger stocks with increased interest and warehouse charges on account of the distances from sources of supply, infrequent turnover of stock and uncertainty as to delivery of goods in transit. Moreover, the Far West presents a wide variation in demand due to a small population spread over a wide area in agricultural and mining communities, as contrasted with the denser population of the East and Middle West, their nearness to the sources of supply, the more frequent turnover in stocks and the constant demands which arise in industrial centers. Price variations may be due to difference in grade of products of different manufacturers, to local conditions, or to both.

ARMORED CONDUCTOR, FLEXIBLE STEEL

Single-Conductor

B. & S. Size	List per 1000 Ft.
No. 14 solid	$61.00
No. 12 solid	71.00
No. 10 solid	90.00
No. 8 solid	106.00
No. 6 solid	145.00
No. 10 stranded	95.00
No. 8 stranded	115.00
No. 6 stranded	160.00
No. 4 stranded	205.00
No. 2 stranded	266.00
No. 1 stranded	315.00

Twin-Conductor

No. 14 solid	104.00
No. 12 solid	135.00
No. 10 solid	185.00
No. 8 stranded	235.00
No. 6 stranded	370.00
No. 4 stranded	575.00

NET PRICE AND DISCOUNT PER 1000 FT.—NEW YORK

Single-Conductor

	No. 14 Solid
Less than coil	List to + 15%
Coil to 1000 ft	10%
	No. 12 Solid
Less than coil	List to + 15%
Coil to 1000 ft	10%

Twin-Conductor

	No. 14 Solid
Less than coil	List to 120.00
Coil to 1000 ft	$93.60 to $100.00
	No. 12 Solid
Less than coil	List to + 15%
Coil to 1000 ft	10%

DISCOUNT—CHICAGO

Single-Conductor

	No. 14 Solid
Less than coil	+ 10%
Coil to 1000 ft	10%
	No. 12 Solid
Less than coil	+ 10%
Coil to 1000 ft	10%

Twin-Conductor

	No. 14 Solid
Less than coil	+ 10%
Coil to 1000 ft	10%
	No. 12 Solid
Less than coil	+ 10%
Coil to 1000 ft	10%

ATTACHMENT PLUGS

List ranges from $0.22 to $0.30 each.
Standard packages from 100 to 250.

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	$24.00 to + 10%
1/5 to std. pkg	19.80 to 8%
Std. pkg	18.75 to 25%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	12%
1/5 to std. pkg	20%
Std. pkg	44%

BATTERIES, DRY

NEW YORK

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.40	$0.40
12 to 50	.35	.35
50 to barrel	.31	.32
Barrel lots	.285	.295

BATTERIES, DRY—Continued

CHICAGO

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$.40	$0.40
12 to 50	.35	.35
50 to barrel	.3175-.3190	.3275-.3290
Barrel lots	.2875-.2890	.2975-.2990

CONDUIT, METALLIC FLEXIBLE

Size, In.	Ft. per Coil	List, per 100 Ft.
5/16	250	$5.00
3/8	250	7.50
1/2	100	10.00
3/4	50	13.00
1	50	21.00
1 1/4	50	**26.00**
1 1/2	25–50	35.00
2	25–50	45.00
2 1/2	25–50	52.00

NET PER 100 FT.—NEW YORK

	Less Than Coil	Coil to 1000 Ft.
3/8-in. s. stp.	List to $82.50	$63.75 to $67.50
3/8-in. d. stp.	$82.50 to 84.00	69.00 to 75.00
1/2-in. s. stp.	List to 110.00	85.00 to 90.00
1/2-in. d. stp.	110.00 to 112.00	92.00 to 100.00

NET PER 1000 FT.—CHICAGO

	Less Than Coil	Coil to 1000 Ft.
3/8-in. single strip	List	$63.75
3/8-in. double strip	78.25-78.75	71.25-71.75
1/2-in. single strip	List	85.00
1/2-in. double strip	105.00	95.00

CONDUIT, NON-METALLIC FLEXIBLE

Size, In.	List per Foot	Size, In.	List per Foot
7/32	$0.05 1/2	1	$0.25
1/4	.06	1 1/4	.33
3/8	.09	1 1/2	.40
1/2	.12	1 3/4	.47
5/8	.15	2	.55
3/4	.18	2 1/4	.65

NET PER 1000 FT.—NEW YORK

	Less Than $15 List	$15 to $60 List	$60 to $150 List
7/32-in.	$25.00-$38.50	$20.50-$26.00	$20.00-$24.00
1/4-in.	$28.00-$42.00	$22.50-$28.20	$22.00-$26.00

NET PER 1000 FT.—CHICAGO

	Less Than $15 List	$15 to $60 List	$60 to $150 List
7/32-in.	$36.00-$55.00	$25.00	$22.50
1/4-in.	$40.00-$60.00	27.00	25.00

CONDUIT, COUPLINGS AND ELBOWS, RIGID IRON

Card No. 39

Size, In.	Conduit, List per Foot
1/4	$0.08 1/2
3/8	.08 1/2
1/2	.08 1/2
3/4	.11 1/2
1	.17
1 1/4	.23
1 1/2	.27 1/2
2	.37 1/2
2 1/2	.58 1/2
3	.76 1/2

CONDUIT, COUPLINGS AND ELBOWS, RIGID IRON—Continued

Size, In.	Couplings, List	Elbows, List
1/4	$0.05	$0.19
3/8	.06	.19
1/2	.07	.19
3/4	.10	.25
1	.13	.37
1 1/4	.17	.45
1 1/2	.21	.50
2	.28	1.10
2 1/2	.40	1.80
3	.60	4.80

DISCOUNT—NEW YORK

	1/4 in. to 1/2 in.	3/4 in. to 3 in.
Less than 2500 lb.	4% to 6%	7% to 10%
2500 to 5000 lb.	6%	9% to 11%

(For galvanized deduct six points from above discounts.)

DISCOUNT—CHICAGO

	1/4 in. to 1/2 in.	3/4 in. to 3 in.
Less than 2500 lb.	6.8% to 8.9%	8.8% to 10.9%
2500–5000 lb.	9.8% to 11.9%	11.8% to 13.9%

(For galvanized deduct six points from above discounts.)

FLATIRONS

NEW YORK

List price	$5.00 to $6.00
Discount	25% to 30%

CHICAGO

List price	$5.00 to $6.00
Discount	25% to 30%

FUSES, INCLOSED

	Std. Pkg.	List
250-Volt		
3-amp. to 30-amp.	100	$0.25
35-amp. to 60-amp.	100	.35
65-amp. to 100-amp.	50	.90
110-amp to 200-amp.	25	2.00
225-amp. to 400-amp.	25	3.60
450-amp. to 600-amp.	10	5.50
600-Volt		
3-amp. to 30-amp.	100	$0.40
35-amp. to 60-amp.	100	.60
65-amp. to 100-amp.	50	1.50
110-amp to 200-amp.	25	2.50
225-amp. to 400-amp.	25	5.50
450-amp. to 600-amp.	10	8.00

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	30%
1/5 to std. pkg.	40% to 41%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	28% to 30%
1/5 to std. pkg.	38% to 40%

FUSE PLUGS

3-Amp. to 30-Amp.

NEW YORK

	Per 100 Net
Less than 1/5 std. pkg.	$5.00 to $6.30
1/5 to std. pkg.	4.50 to 5.25
Standard packages, 500. List, each	$0.07

CHICAGO

	Per 100 Net
Less than 1/5 std. pkg.	$6.25
1/5 to std. pkg.	5.25
Standard packages, 500. List, each	$0.07.

LAMPS, MAZDA

105 to 125 Volts

	Std. Pkg.	List, Each
Regular, clear:		
10 to 40-watt—B	100	$0.30
60-watt—B	100	.35
100-watt—B	24	.70
75-watt—C	50	.70
100-watt—C	24	1.10
200-watt—C	24	2.20
300-watt—C	24	3.25
Round bulbs, 3½-in., frosted:		
15-watt—G 25	50	.53
25-watt—G 25	50	.55
40-watt—G 25	50	.55
Round bulbs, 3¾-in., frosted:		
60-watt—G 30	24	.77
Round bulbs, 4⅝-in., frosted:		
100-watt—G 35	24	1.10

DISCOUNT—NEW YORK

Less than std. pkg.....List
Std. pkg 10%

DISCOUNT—CHICAGO

Less than std. pkg.....List
Std. pkg 10%

LAMP CORD

Cotton Covered, Type C, No. 18

NEW YORK

	Per 1000 Ft. Net
Less than coil (250 ft)	$31.00 to $33.30
Coil to 1000 ft	24.98 to 27.90

CHICAGO

	Per 1000 Ft. Net
Less than coil (250 ft)	$29.00 to $30.00
Coil to 1000 ft	21.50 to 22.30

LAMP GUARDS, WIRE

Standard packages from 50 to 150

NEW YORK

Net per 100.....$20.00

CHICAGO

Net per 100.....$21.75

OUTLET BOXES

Nos.	List, per 100
101—A, A1½, 4 S.C., 6200, 320	$30.00
102—B.A., 6200, S.E., 300, A.X., 1½ 4 S	30.00
103—C.A., 9, 4R, B 1½	25.00
106—F.A., 7, C.S., 1½, 3 R	20.00

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $10.00 list	30%	20%
$10.00 to $50.00 list	35%	25%

DISCOUNT—CHICAGO

	Black	Galvanized
Less than $10.00 list	40%	35%
$10.00 to $50.00 list	50%	45%

PIPE FITTINGS

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.....10%
1/5 to std. pkg.....20%
Std. pkg.....30%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.....10%
1/5 to std. pkg.....20%
Std. pkg.....30%

PORCELAIN CLEATS—UNGLAZED

Two and Three Wire

NEW YORK

	Per 1000 Net
Less than 1/5 std. pkg	$15.80
1/5 to std. pkg	14.80

Standard package, 2200. List per 1000, $20.

CHICAGO

	Per 1000 Net
Less than 1/5 std. pkg	$15.80
1/5 to std. pkg	14.80

Standard package, 2200. List per 1000, $20.

PORCELAIN KNOBS

NEW YORK

Per 1000 Net.	Std. Pkg. 3500	Std. Pkg. 4000
	5½ N.C.—Solid Nail-it	—N.C.
Less than 1/5 std. pkg.	$11.85	$30.70 to $30.75
1/5 to std. pkg.	11.10	24.20

CHICAGO

Per 1000 Net.	Std. Pkg. 3500	Std. Pkg. 4000
	5½ N.C.—Solid Nail-it	—N.C.
Less than 1/5 std. pkg.	$11.85	$30.75
1/5 to std. pkg.	11.10 to $11.40	24.20

SOCKETS AND RECEPTACLES

	Std. Pkg.	List
¼-in. cap key and push sockets	500	$0.33
⅛-in. cap keyless socket	500	.30
⅛-in. cap pull socket	250	.60

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.....List to + 10%
1/5 to std. pkg.....8% to 20%

NET PER 100—CHICAGO

Less than 1/5 std. pkg.....25% to 45%
1/5 std. pkg.....23% to 42%

SWITCHES, KNIFE

250-Volt, Front Connections, No Fuse

High Grade:	
30-amp. S. P. S. T.	$0.80
60-amp. S. P. S. T.	1.20
100-amp. S. P. S. T.	2.25
200-amp. S. P. S. T.	3.48
300-amp. S. P. S. T.	5.34
30-amp. D. P. S. T.	1.20
60-amp. D. P. S. T.	1.78
100-amp. D. P. S. T.	3.38
200-amp. D. P. S. T.	5.20
300-amp. D. P. S. T.	8.00
30-amp. 3 P. S. T.	1.80
60-amp. 3 P. S. T.	2.68
100-amp. 3 P. S. T.	5.08
200-amp. 3 P. S. T.	7.80
300-amp. 3 P. S. T.	12.00
Low Grade:	
30-amp. S. P. S. T.	0.42
60-amp. S. P. S. T.	0.74
100-amp. S. P. S. T.	1.50
200-amp. S. P. S. T.	2.70
30-amp. D. P. S. T.	0.68
60-amp. D. P. S. T.	1.22
100-amp. D. P. S. T.	2.50
200-amp. D. P. S. T.	4.50
30-amp. 3 P. S. T.	1.02
60-amp. 3 P. S. T.	1.84
100-amp. 3 P. S. T.	3.76
200-amp. 3 P. S. T.	6.76

DISCOUNT—NEW YORK

	High Grade
Less than $10 list	List
$10 to $25 list	12%
$25 to $50 net	15%
	Low Grade
Less than $10 list	10%
$10 to $25 list	20%
$25 to $50 list	25%

DISCOUNT—CHICAGO

	High Grade
Less than $10 list	+ 5%
$10 to $25 list	10% to 11%
$25 to $50 list	14%
	Low Grade
Less than $10 list	5%
$10 to $25 list	16%
$25 to $50 list	24%

SWITCHES, SNAP AND FLUSH

5-Amp. and 10-Amp., 125-Volt Snap Switches

	Std. Pkg.	List
5-amp. single pole	250	$0.28
5-amp. single-pole, ind	250	.32
10-amp. single-pole	100	.48
10-amp. single-pole, ind	100	.54
5-amp. three-point	100	.54
10-amp. three-point	50	.76
10-amp., 250-volt, D. P.	100	.66

10-Amp., 250-Volt Push-Button Switches

	Std. Pkg.	List
10-amp. single-pole	100	$0.45
10-amp. three-way	50	.70
10-amp. double-pole	50	.70

SWITCHES, SNAP AND FLUSH—Cont'd

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.....List to + 10%
1/5 to std. pkg.....8% to 15%
Std. pkg .....25% to 28%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.....List to + 20%
1/5 to std. pkg.....List to 15%
Std. pkg 30%

SWITCH BOXES, SECTIONAL CONDUIT

Union and Similar—	List, Each
No. 155	$0.34
No. 160	.60

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $2.00 list	List	List
$2.00 to $10.00 list	10%	5%
$10.00 to $50.00 list	20%	15%

DISCOUNT—CHICAGO

	Black	Galvanized
Less than $2.00 list	25%	20%
$2.00 to $10.00 list	25%	20%
$10.00 to $50.00 list	25%	20%

TOASTERS, UPRIGHT

NEW YORK

List price .....$5.00 to $6.00
Discount .....25% to 30%

CHICAGO

List price .....$4.50 to $6.00
Discount .....25% to 30%

WIRE, ANNUNCIATOR

NET PRICE—NEW YORK

	Per Lb. Net
No. 18, less than full spools	$0.44-$0.44¼
No. 18, full spools	0.43- 0.43¼

CHICAGO

	Per Lb. Net
No. 18, less than full spools	$0.57½-$0.65
No. 18, full spools	0.50½- 0.55

WIRE, RUBBER-COVERED, N. C.

Solid-Conductor, Single-Braid

NEW YORK

	Price per 1000 Ft. Net		
No.	Less than 500 Ft.	500 to 1000 Ft.	1000 to 5000 Ft.
14	$15.00	$13.00-$14.00	$11.50-$12.25
12	23.25-$23.60	19.96- 21.30	15.60- 19.35
10	32.40- 33.20	27.66- 29.70	21.63- 27.00
8	45.63- 45.70	38.66- 41.90	30.18- 38.00
6	72.40- 72.93	61.71- 66.35	48.25- 60.30

CHICAGO

	Price per 1000 Ft. Net		
No.	Less than 500 Ft.	500 to 2500 Ft.	2500 to 5000 Ft.
14	$18.00	$13.00	$11.50
12	25.69-$26.28	22.02-$22.48	18.55- 20.93
10	30.49- 36.54	27.94- 31.26	22.86- 29.23
8	42.54- 51.57	38.99- 44.13	31.90- 41.36
6	67.38- 88.38	56.15- 75.61	50.53- 70.70

WIRE, WEATHERPROOF

Solid-Conductor, Triple-Braid, Size 4/0 to 8 Inc.

NEW YORK

	Per 100 Lb. Net
Less than 25 lb	$35.25 to $36.85
25 to 50 lb	35.25 to 36.85
50 to 100 lb	34.25 to 36.10

CHICAGO

	Per 100 Lb. Net
Less than 25 lb	$40.00 to $40.35
25 to 50 lb	39.00 to 39.35
50 to 100 lb	28.00 to 38.35

NEW APPARATUS & APPLIANCES

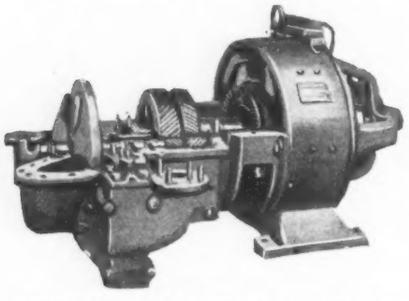
A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

Small Geared Turbines

To drive small electric lighting outfits, exciter units for large alternators, or for direct mechanical drive, the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has developed a line of small geared turbines, constructed along the line of the larger turbine units, which give durability, ease of adjustment and high economy. These units especially meet the demand for lighting sets in the merchant marine service. They are manufactured in sizes from 15 kw. to 50 kw. for direct-current service and from 30 kw. to 50 kw. for alternating-current service. The turbines are made in 30 hp. to 100 hp. for mechanical drive.

The turbine operates at a speed of 7200 r.p.m. and is suitable for both condensing and non-condensing operation. It is built for normal operation on any steam pressure from 75 lb. to 250 lb. (5.3 kg. to 17.6 kg. per sq. cm.) and for non-condensing operation on any back pressure up to 20 lb. (1.4 kg. per sq. cm.). The generator is of the Westinghouse "SK" type, compound-wound, with commutating poles. The outboard generator bearing is supported by a single-piece bracket bolted to the frame. In this a steel shell lined with babbitt forms the bearing itself, and as it is pressed and pinned into place it may be readily removed or renewed in case of trouble. One of the special features of the unit is the automatic throttle valve, operated directly from the governor by means of a connecting rod. This valve is of the balanced type and very sensitive in operation, thus insuring a close speed regulation

One of the latest refinements provided on very few small turbines is the



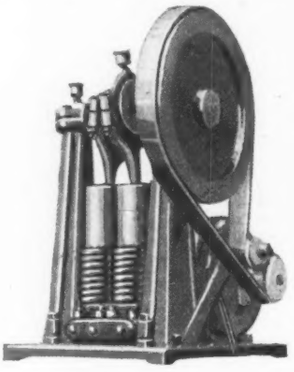
TURBO-GENERATOR LIGHTING SET FOR MARINE SERVICE WITH COVER REMOVED

overspeed governor release. This is a simple device contained in a small hole drilled in the shaft between the pinion and the rotor, consisting of a cylindrical weight held in place by a coil spring surrounding it. In case the turbine should speed up to 10 per cent above normal speed, the weight due to centrifugal force overcomes the spring tension and protrudes a short distance from its normal position. By so doing it comes in contact with a lug, which in turn is fastened to a lever, the movement of which trips the throttle-valve catch and allows the valve to be closed by a heavy coil spring.

This line of turbo-generators conforms to the Navy Department's specifications for ship service, being provided in this case with both steam and water-sealed glands and non-corrosive brass piping.

Two-Cylinder Motor-Driven Air Compressor

The Midvale Machine Works, St. Louis, Mo., is manufacturing a continuous-service air compressor suitable for garages. It is of the two-cylinder type, having plungers fitted with metal pis-



A 0.25-HP. MOTOR DRIVES THIS COMPRESSOR CONTINUOUSLY

ton rings. The compressor is equipped with an air filter that prevents any oil from entering the tire undergoing inflation. The machine has a capacity of 1.25 cu. ft. (0.038 cu. m.) of air per minute. It is equipped with an 0.25-hp. motor for either alternating current or direct current. Complete with cast base and flywheel, the machine weighs 150 lb. (68 kg.). The manufacturer claims that it will deliver an operating pressure of 100 lb. per square inch. (70 kg. per sq. cm.).

Completely Inclosed Hand Magnet

The magnetic coils, switch and connections of the C-H hand magnet are now covered by two aluminum castings. The upper aluminum casting forms the yoke cover, switch cover and handle support. The lower casting covers the coils and leaves only the soft iron poles projecting. The circuit to the magnetic coils is closed and opened by means of a large trigger, mounted under the handle in the handle support, which operates a strong make-and-break switch concealed in the upper aluminum cover. The trigger is operated by the index finger. Pulling it toward the handle closes the switch.

DEVICE CONTROLLED BY TRIGGER

When slightly released the switch does not open, but when fully released the switch opens with a quick break. The magnet can be used effectively in plants such as those of metal dealers, smelters and refiners, iron and brass foundries, machinists, paint manufacturers, chemical works, paper mills, fertilizer plants, flour mills, enamelers, tinners, electroplaters, malt houses, hardware dealers, plumbing manufacturers, garages, fixture manufacturers, mathematical instrument makers and shipping departments of many factories. In the manufacture of spelter solder they are used to remove copper-coated iron and steel wire. Suspended with its two poles immersed in the liquid, the magnet will attract to itself any particles of iron or steel in the tubs in which paints, glazes, chemicals, etc., are mixed.

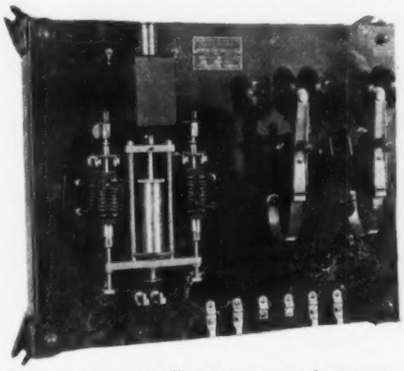
The device described above is manufactured by the Cutler-Hammer Manufacturing Company of Milwaukee, Wis., and is furnished with 5 ft. (1.5 m.) of reinforced cord and a standard C-H separable attachment plug.

Multi-Value Overload Relay for A.-C. Motors

Complete protection against overload is claimed for a multi-value overload relay which is being manufactured by the Monitor Controller Company of Baltimore, Md. The relay has trip coils in two legs of the circuit. In starting, the air gap in the magnetic circuits of these coils is opened to the point where it requires maximum current to trip the overload relay. The main magnetic switch then closes, and the air gap in the overload magnets slowly closes until at about the time the motor reaches full speed the cores are in the

proper position to trip at the current value at which the overloads are set. This makes it possible to set the overload trip with respect to the running load and thus gives complete protection against overload. The current at which the overload relay trips has one value for starting, another for running, and intermediate values during the starting period.

As the overload release may be set for the running load, it gives ample



"ACROSS-THE-LINE" STARTER FOR THREE-PHASE SQUIRREL-CAGE MOTORS

protection against single-phase running. In case one phase fails, the overload in the remaining phase is sufficient to trip the overload relay. The accompanying illustration shows the relay in connection with the main magnetic switch. This combination is known as type 1120 "across-the-line" starter for three-phase squirrel-cage motors.

Armored Corner Insulator for Feeder Cables

Feeder cables can be securely held on curves by the Pittsburgh-type corner insulators marketed by the Westinghouse Electric & Manufacturing Company of East Pittsburgh, Pa. This insulator is provided with a special collar or retaining ring for use where the curve is slight and the cable likely to slip off an ordinary insulator. The collar has an extended lip which curves up around the cable and keeps it in the groove regardless of the angle at which the cable turns, thus eliminating the

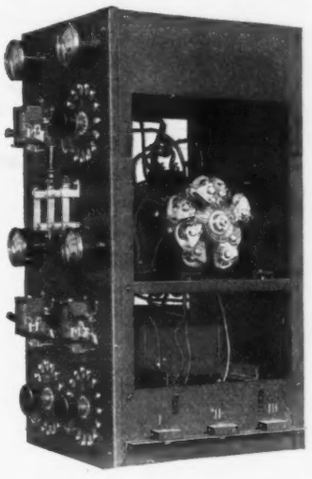
NO TIE WIRES NEEDED FOR THIS CORNER INSULATOR

necessity for tie wires and saving time in erection. The collar is free to move on the insulator cap, so that after the insulator is screwed to the pin the collar may be turned until the cable seat is in the best position to support the cables.

For sharp curves the insulator can be used without this collar, as the deep side groove holds the cable firmly in position. These insulators are made of molded insulation surrounded by a sherardized malleable-iron cap. They are made with a 1-in. (2.54-cm.) pinhold and are furnished in two sizes for feeders of 500,000 circ. mils and 1,000,000 circ. mils respectively.

Flexible Charging Outfit

Charging at a high rate without overheating the batteries can be obtained by means of a commutating rectifier that is being manufactured by the Stahl Rectifier Company, 1401 West Jackson Boulevard, Chicago. Three rectifying commutators with one-quarter of the sections dead produce pulsating currents, which, the manufacturers claim, allows charging at a high rate without overheating the batteries. Because of an independent regulator for each circuit these three circuits can be charged at any rate from 4 amp. to 12 amp. One circuit can be charging one line of batteries at a rate of 10 amp., another circuit can be charging at a rate of only 5 amp., and a third circuit can be



RECTIFIER WITH THREE COMMUTATORS SHOWN WITHOUT BASE

charging at an entirely different rate—all three operating at the same time. It is said that a minimum amount of energy is lost by the Stahl rectifier because the current from the main line is reduced by a transformer and not by resistance to obtain the desired voltage for the commutator. The rectifier model SX is complete with switchboard, voltmeter, ammeter and voltage regulators, all ready to connect up to the main line and batteries. The illustration shows the outfit, which comes mounted on a structural-steel base.

Electric Dubber for Ships

An electric dubber requiring only one operator, perfected and manufactured by Gray & Barash of Seattle, is said to be able to do the work of twenty men working with adzes. In effect, the electric dubber planes the interior and exterior sides of the frames so that a smooth and even surface is presented for the planking and sealing. This work heretofore has been done wholly by hand with the adze. The adze gives a surface of 65 to 70 per cent fair or even; the electric dubber gives a surface 100 per cent even. As its name implies, this machine is a mechanical means for dressing off the irregular and uneven surfaces of the frames on wooden vessels preparatory to planking.

It employs a cutting member consisting of a rotating cutter head with the knives secured to the face of the head. This cutting head is mounted on the shaft of a specially constructed alternating-current motor running at a speed of 3600 revolutions per minute. The motor, through the means of ball and socket joints, has a three-point suspension within an adjustable carriage, mounted upon two bars which are transverse to the direction of travel. These transverse bars are supported at their ends by arms at one extremity of which are grooved wheels running on annular ball bearings. These wheels ride on the head of a standard 8-lb. (3.6-kg.) "T" rail. Two of the rails form a trackway upon which the dubbing machine is moved. The rails are secured to the surface to be dressed through some convenient means and are sufficiently light to be formed to the contour of the vessel and take the molded shape of the surface to be dressed, thereby determining the finished surface of the part to be dubbed.

The coarse adjustment of the machine is made through a rack and pinion arrangement on the supporting arms, the fine adjustment of the cutter head both as to elevation and angular position being secured through screws working through the three balls and socket joints. The lateral movement along the transverse bars is obtained by the two lead screws manipulated through a removable crank. Through this system of adjustable carriage members the machine is capable of universal adjust-

ELECTRICALLY OPERATED MACHINE CAN DO WORK OF TWENTY MEN

ment within a certain range of movements, enabling it to be operated in a horizontal, vertical or any other position intermediate or between these points.

Trade Notes

JOHN F. GOOFREY, manufacturer of coal-handling conveyors, has removed his plant from Elkhart, Ind., to Chicago.

THE CENTURY ELECTRIC COMPANY of St. Louis, Mo., now has its Cincinnati sales office at 510 Traction Building, its Pittsburgh office at 1017 Bessemer Building, and its Chicago sales office at 902 Randborn Building.

W. E. HAWLEY, formerly connected with the George Cutter Company, of South Bend, Ind., in the switchboard department, is now with the Penn Electrical & Manufacturing Company of Irwin, Pa., manufacturer of switchboards and panelboards.

THE NATIONAL TRADE ACCEPTANCE BUREAU, Inc., of New York City, has started to issue the *Trade Acceptance Journal*, which takes for its motto "Sound credit rests on sound finance." The contents of the first (May) number are pertinent and informing. The publication office is 421 Nassau Street.

THE NAVY DEPARTMENT, Bureau of Supplies and Accounts, Division of Inland Traffic, Washington, D. C., under date of May 15, has issued circular No. 5 to navy contractors and navy shipping officers. The subject is recording the movement of carload shipments of certain United States government freight. Twelve different matters are covered in the circular, explanatory and descriptive of freight handled.

LE COMPTOIR NATIONAL BELGIQUE has issued a circular on the "economical reconstruction of Belgium." The organization will aid Belgian business and industries to replenish themselves with material "in the shortest time possible after the evacuation of the country by the enemy." Electric appliances are especially designated, among other articles, as a requisite in the wholesale building. Prices and copies of trade catalogs, specifications, etc., are requested by the Liège Social, 15 rue Louis le Grand, Liège, Belgium.

WASHING-MACHINE FACTORIES IN TORNADO.—The Maytag Company of Newton, Iowa, on May 21 was damaged to the extent of $75,000 by a tornado. The top floors of this company, as well as that of the Automatic Electric Washer Company, Inc., were partly blown off. A corner of the One-Minute Manufacturing Company was also damaged, one workman being killed and about ten injured. The output of these electric washing-machine manufacturers is but slightly curtailed, and deliveries, it is stated, will be made as usual.

THE MECHANICAL APPLIANCE COMPANY of Milwaukee, Wis., has recently placed C. G. Tarkington in charge of its Washington office, at 1407 L Street N. W. Through this office the company is assisting the government and is in a position to render service to its customers in their relations with the government. Mr. Tarkington was graduated from Purdue University in 1901 and then entered the engineering department of the Cutler-Hammer Manufacturing Company, with which he was connected for a number of years. He was with the Chicago sales office of the Westinghouse Electric & Manufacturing Company for seven years.

THE ELECTRICAL ENGINEERING COMPANY of Chicago was incorporated last December under the laws of the State of Illinois to engage in the design, manufacture and sales of electrical devices, particularly specializing in moving-picture control apparatus, high and low tension transformers and coil winding. R. A. Connor, the president, was formerly connected with the Thordasson Electrical Company as general manager and designing engineer. J. H. Thompson, vice-president, was formerly connected with the same firm as sales manager. G. C. Jensen, secretary and treasurer, has served in several capacities with large central stations.

THE ORDNANCE DEPARTMENT of the United States Army, during April placed orders for the following electric goods with the companies named: Generating units, 4-kw. switchboards complete for 1332 artillery repair trucks, Universal Motor Company, Oshkosh, Wis.: miscellaneous wire and cable for United States filling plant, Simplex Wire & Cable Company, Boston; oil circuit breakers and lightning arresters, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.; switchboards and equipment, General Electric Company, Schenectady, N. Y.; No. 10 AWG Colonial copper-clad weatherproof wire, estimated weight 250 lb, Standard Underground Cable Company, Pittsburgh, Pa.

THE LUX MANUFACTURING COMPANY announces that it has surrendered its premises at the Factory Terminal Building, Hoboken, N. J., to the United States government for the benefit of the War Department. The company is now located in its new building at 123-133 East Kinney Street, Newark, N. J. The new building permits an increased production of Lux lamps, and as the result the company says customers may expect better deliveries. Factory operations were not entirely suspended, as a part of the plant was installed before the Hoboken plant was closed down. The company expects to be running at full capacity within at least several weeks. Special attention is being paid to employee welfare at the new plant.

Trade Publications

FANS.—The Century Electric Company of St. Louis has issued a folder illustrating and describing alternating-current fans.

OFFICE EQUIPMENT.—The Manufacturing Equipment & Engineering Company, Boston, is distributing several booklets describing its lockers, drinking fountains, washbowls, etc.

SINGLE-PHASE MOTORS.—The Century Electric Company of St. Louis has issued a circular describing its single-phase motors and illustrating their application to various appliances.

HAND MAGNET.—A light-weight inclosed hand magnet is illustrated and described in publication No. 250, distributed by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

STOKERS. — High-capacity stokers for higher volatile coals are described in a booklet issued by the Laclede-Christy Clay Products Company, St. Louis, Mo. The operation of these is given.

MOTORS.—Induction motors are described and illustrated in a circular being distributed by the Cleveland Electric Motor Company of Cleveland, Ohio. The type "M" motors are discussed.

FIXTURES. — Commercial lighting fixtures are described in the *Business Building Bulletin*, distributed by the Beardslee Chandelier Manufacturing Company, 216 South Jefferson Street, Chicago.

INDUCTION MOTORS.—The St. Louis Electrical Works, 4060 Forest Park Boulevard, St. Louis, Mo., has issued a bulletin describing and illustrating its induction motors of single-phase and polyphase type. The publication is known as Booklet 5.

SPEED CONTROLLERS. — Armature speed controllers, type R, of the Ward Leonard Company, Mount Vernon, N. Y., are described in a circular that this company has recently published. Prices are given for all sizes for controlling small motors.

ELECTRIC APPLIANCES. — The two-page advertisements to be run in the June 29 issue of the *Saturday Evening Post* are reproduced in a circular distributed by the Hotpoint division of the Edison Electric Appliance Company, Inc., 5660 West Taylor Street, Chicago.

BATTERIES.—Bulletin No. 169 has been issued by the Electric Storage Battery Company, Allegheny Avenue and Nineteenth Street, Philadelphia, describing its oil-switch batteries. Electrical descriptions are given showing the application of the storage batteries to switching apparatus.

HIGH-TENSION EQUIPMENT. — The Delta Star Electric Company, Chicago, is distributing bulletin No. 33, devoted to high-tension switching and protective equipment. This sixty-four-page bulletin has 309 illustrations and contains considerable technical information. Copies will be sent upon request.

ELEVATORS. — The Standard Plunger Elevator Company, Worcester, Mass., is distributing a bulletin describing its passenger elevators, freight elevators, baggage lifts, sidewalk lifts and hydraulic dumbwaiters, with automatic push-button control for all service. Typical installations are listed in the bulletin. An interesting photograph is reproduced showing a plunger 365 ft. long.

STORAGE BATTERIES.—The Electric Storage Battery Company, Allegheny Avenue and Nineteenth Street, Philadelphia, has issued Bulletin No. 170, describing and illustrating the "Exide" battery for portable signal service. Type KXS and type KXCS batteries are equipped with cases to which handles are attached, thus allowing easy handling. The several parts of the batteries are described and illustrated.

MOTORS AND GENERATORS. — The Crocker-Wheeler Company of Ampere, N. J., has issued bulletins No. 183, 184 and 185, describing some of its electrical apparatus. Titles of these bulletins are "Motor Drive for Printing Machinery," "Direct-Current Lighting and Power Generators" and "Coupled and Belt Types of Alternating-Current Generators" respectively. Illustrations and electrical descriptions of the apparatus are contained in these bulletins.

New Incorporations

THE A. S. LAUFERTY COMPANY of Boston, Mass., has been incorporated with a capital stock of $50,000 to manufacture telephone devices and apparatus.

THE STANDARD BATTERY MANUFACTURING COMPANY of Fort Worth, Tex., has been chartered with a capital stock of $1,000 by Solomon Casseb, Samuel Greco and Adolph Barbelo.

THE ELECTRICAL EQUIPMENT COMPANY of Morgantown, W. Va., has been incorporated by Arthur Hall, Lester R. Gehagen, Earl F. Hall and others. The company is capitalized at $25,000.

THE CONSOLIDATED ELECTRIC COMPANY of Taunton, Mass., has been incorporated with a capital stock of $4,000. The directors are Edward R. Duclos, president; Berton T. Mowry, treasurer, and F. M. Mowry.

THE ELECTRIC KITCHEN CORPORATION of Brooklyn, N. Y., has been chartered with a capital stock of $30,000 by J. H. Pawling, B. C. Sprague and H. A. Prefethen, 238 Fort Washington Avenue, Brooklyn, N. Y.

THE BURTON-POORE ELECTRIC COMPANY of Norfolk, Va., has been chartered with a capital stock of $5,000 to do a general electric business. J. M. Burton is president, and E. S. Poore is secretary, both of Norfolk.

THE ARKANSAS BATTERY COMPANY of Little Rock, Ark., has been incorporated by W. P. Galloway, president and treasurer; J. W. Hamm, vice-president, and C. P. Pierce, secretary. The company is capitalized at $9,000.

THE CARBON COMPANY of Union, N. J., has been chartered by Edward J. Simon, John T. Simon and Mydron D. Grove of Weehawken. The company is capitalized at $100,000 and proposes to manufacture incandescent lamps.

THE BOLTON-WECHTEL COMPANY of Brooklyn, N. Y., has been incorporated by H. J. Wechtel and W. C. Bolton, 261 Stuyvesant Avenue, Brooklyn, N. Y. The company is capitalized at $20,000 and proposes to deal in batteries and auto accessories.

THE THREADLESS PIPE SETTING COMPANY of Newark, N. J., has been incorporated with a capital stock of $30,000 to manufacture electrical appliances. The incorporators are Joseph G. Fenster, Samuel Lederman and Edward S. Schwartz of Newark, N. J.

THE BROCKMAN BROTHERS COMPANY of Greer, S. C., has been incorporated with a capital stock of $5,000 to deal in plumbing materials, pumps and gas and electric lighting outfits, etc. The incorporators are J. O. Brockman and R. H. Bearden, both of Greer.

THE STANDARD ELECTRIC & ACETYLENE WELDING COMPANY of Montreal, Que., has been incorporated with a capital stock of $10,000 to manufacture tools, machinery, implements, etc. The incorporators are Richard T. Henecker, Henry N. Chauvin, Hugh Wylie and others.

THE LIBERTY BATTERY COMPANY of Sacramento, Cal., has been incorporated by James S. Remick, Edward Farmer, Porter C. Anderson, C. E. Winters and C. E. Gass. The company is capitalized at $10,000 and proposes to establish a general storage battery business and to do all kinds of electrical work.

THE CLEVELAND ARMATURE WORKS, INC., has filed articles of incorporation under the laws of the State of Delaware with a capital stock of $2,000,000, to manufacture electric machines, generators and batteries. The incorporators are C. L. Rimlinger, M. M. Clancy and F. A. Armstrong of Wilmington, Del.

THE TECHNICAL DEVELOPMENT CORPORATION of New York, N. Y., has been incorporated by F. D. Hearn, J. A. Hanway and J. J. McCormack, 71 East Eighty-sixth Street, New York City. The company is capitalized at $100,000 and proposes to manufacture and deal in electrical and mechanical equipments.

New England States

WATERVILLE, ME.—Plans are being prepared by I. W. Jones of Milton, N. H., for the construction of a new hydroelectric power plant at the works of the Lockwood Company in Waterville.

WYTOPITLOCK, ME.—The Springer Lumber Company is installing a new steam-driven pump and an electric generator.

BURLINGTON, VT.—The Queen City Cotton Company has awarded the contract for wiring and installing electric fixtures in 67 tenements to the Burlington Light & Power Company.

DANA, MASS.—The Dana Board of Trade is considering a proposal submitted by the Gardner Electric Light Company for lighting the town.

NATICK, MASS.—The Northways Motor Corporation, recently incorporated, has acquired a site of 30 acres in Natick on which it will erect a plant for the manufacture of motor trucks, tractors, special motors and passenger cars. The officers are: James F. Cavanaugh, president; R. R. Northway, vice-president and chief engineer; J. H. Walker, treasurer and general manager of the Walker-Wells Manufacturing Company and Amesbury Body Company, is chairman of executive committee.

WEBSTER, MASS.—The New England Power Company has petitioned the Board of Selectmen for a franchise to cross the highways in five places in Webster.

WELLESLEY, MASS.—Plans are being prepared by French & Hubbard, 88 Pearl Street, Boston, for the construction of an addition, 35 ft. by 45 ft., to the boiler house at Wellesley College.

LONSDALE, R. I.—Plans have been filed by the Lonsdale (R. I.) Company and contract has been awarded to the J. W. Bishop Company, 109 Foster Street, Worcester, Mass., for the construction of a new transformer building at its plant.

NEW LONDON, CONN.—The general contract for the construction of the new power house and machine shop at the submarine base for the United States government has been awarded to the Evatt Construction Company, 161 Devonshire Street, Boston, Mass.

STAMFORD, CONN.—Contract has been awarded by the Stamford Gas & Electric Company to the Vuono Construction Company of Stamford for the construction of a new brick pump and screen plant and valve house at its works, to cost about $10,000.

Middle Atlantic States

AUBURN, N. Y.—The Empire Gas & Electric Company has petitioned the Public Service Commission for permission to issue $171,000 in bonds, the proceeds to be used for extensions and improvements.

BINGHAMTON, N. Y.—The Binghamton Cutlery Works has awarded a contract to the Binghamton Light, Heat & Power Company for furnishing electricity to operate the new plant of the company to be established by the cutlery company. About 150 hp. will be required for the initial operations.

BROOKLYN, N. Y.—Contract has been awarded by the War Department to the Turner Construction Company, 242 Madison Avenue, New York, for the construction of the new terminal on Second Avenue, between Fifty-eighth and Sixty-fifth Streets, South Brooklyn, to cost about $40,000,000. The buildings will be equipped with cranes, hoisting and conveying machinery, etc.

BUFFALO, N. Y.—The International Railway Company is planning the construction of 8.7 miles of new track in Buffalo this year. The cost is estimated at about $870,000.

CORNING, N. Y.—The Corning Painted Post Street Railway Company is contemplating the construction of an extension of its car line to North Corning.

CENTRAL ISLIP, N. Y.—Bids will be received by the State Hospital Commission, Capitol, Albany, until June 5 for new boilers and heating work for the new central heating and lighting plant at the Central Islip State Hospital. Drawings and specifications may be consulted at the hospital at Central Islip, at the New York office of the Department of Architecture, Room 1224, Woolworth Building, and at the Department of Architecture, Capitol, Albany. Lewis F. Pilcher is state architect. E. S. Elwood is secretary of state hospital commission.

CORNING, N. Y.—The bill granting the Lamoka Electric Water Power Corporation a charter has been signed by Governor Whitman. The company proposes to construct a large concrete dam across the Lamoka Valley above Bradford to impound and store up the overflow from Lake Lamoka and Lake Wanita. This water will be carried in a large concrete tunnel to the shores of Lake Keuka, a drop of 390 ft. in 2 miles, there used to generate electrical energy at a plant to be located near Grove Springs. Electricity generated at the plant will be transmitted to Corning, Penn Yan, Hammondsport, Watkins, Bath and other towns for commercial purposes.

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

JAMESTOWN, N. Y.—Plans have been prepared by F. A. Shoemaker, Builders' Exchange, Buffalo, for the construction of an addition to the boiler plant of the Art Metal Construction Company at Jones Street and G Avenue.

NEW YORK, N. Y.—The United Machine Works, 55 West Third Street, New York, it is reported, would like to receive prices on oil engines and generators. Alternating-current units, directly connected, from 100 to 500 hp., preferred.

NEW YORK, N. Y.—Bids will be received by W. W. Wotherspoon, superintendent of public works, Capitol, Albany, until June 18 for installing electric wiring, lighting, power, battery-charging equipment and auto truck scales for Pier 6 East River, New York City. For details see Searchlight Department.

OLEAN, N. Y.—Bids will be received by Captain John A. Coffey, secretary to the State Board of Armory Commissioners, 158 State Street, Albany, until June 12 for construction, heating, sanitary and drainage and electric work in connection with the reconstruction and addition to the Olean Armory. Plans and specifications may be seen at the above office, at the New York office of the Department of Architecture, Room 1224, Woolworth Building, and at the Department of Architecture, Capitol, Albany. Drawings and specifications may be obtained at the Department of Architecture, Capitol, Albany. Lewis F. Pilcher is State architect.

OTISCO, N. Y.—The Otisco Light & Power Company has petitioned the Public Service Commission for permission to construct and operate an electric-lighting plant in Otisco and also to take over the local electric plant, owned by Earl T. Harter.

SAYVILLE, N. Y.—Contract has been awarded to the E. J. Electric Installation Company, 221 West Thirty-third Street, New York City, by the United States government for the installation of a new electric floodlighting system at the local wireless station.

WATERTOWN, N. Y.—Plans are under consideration by the Northern New York Utilities Company, 137 Arsenal Street, for a new power development on the Black River, to cost about $300,000. James Brownell of Strickland is engineer.

ELIZABETH, N. J.—The Dusenberg Motors Corporation of Elizabeth is contemplating building an addition to its plant, part of which is to be used as a motor testing department. The cost is estimated at $90,000.

HARRISON, N. J.—Plans have been filed and contract awarded to Edward M. Waldron, 665 Broad Street, Newark, for the construction of a new building, 50 ft. by 100 ft., at the local plant of the General Electric Company.

JERSEY CITY, N. J.—The lowest bid for electrical work for the proposed new public school buildings Nos. 6 and 23, to cost about $754,000 and $780,000 respectively., was submitted to the City Commission by Hoffman & Elias, 549 Colbs Avenue, New York City, at $11,489 and $12,179 respectively.

NEWARK, N. J.—An appropriation of $97,350 to be used for lighting, heating and power purposes for the various institutions throughout the county, covering a period from May 8 to Dec. 31, 1918, has been approved by the Board of Freeholders.

OGDENSBURG, N. J.—The boiler plant at the limestone quarry of the Wharton Steel Company was recently destroyed by fire. The structure will be rebuilt at once.

PHILLIPSBURG, N. J.—The Lapatoong Water Company, it is reported, is contemplating improvements to its system, including the erection of a pumping and power generating station.

POMPTON LAKES, N. J.—Plans have been completed for the construction of a new hydroelectric power plant on Corning Lake. The building will be about 40 ft. by 65 ft. A bond issue of $46,000 has recently been authorized by the Borough Council.

PRINCETON, N. J.—Plans are under consideration by the Borough Council for improvements to the electric fire-alarm system.

CHESTER, PA.—Plans have been filed by the Philadelphia Railway Company for the erection of a repair shop, at Penrose Ferry and Fort Mifflin Roads, consisting of two one-story structures, to cost about $28,000. One of the buildings, 70 ft. by 78 ft., will be used for woodworking operations.

EASTON, PA.—The William Wharton, Jr., Company, has contracted with the Pennsylvania Utilities Company of Easton for energy to operate its new electric furnace. About 1500 kw. will be required.

ELWOOD CITY, PA.—Notice has been filed with the Public Service Commission by the Pennsylvania Power Company of an issue of $9,000 in bonds, the proceeds to be used for improvements, etc.

ENOLA, PA.—Preparations are being made by the Pennsylvania Railroad Company to begin work on improvements and alterations in its local power plant and engine house.

PHILADELPHIA, PA.—Plans have been prepared by the Mifflin Chemical Corporation, Delaware Avenue and Tasker Street, for an addition to its boiler plant.

PHILADELPHIA, PA.—Plans are being considered by the Scott Paper Company, Seventh Street and Glenwood Avenue, for the erection of a fourth unit at its works at the foot of Market Street, Chester, to cost about $250,000.

PHILADELPHIA, PA.—Contract has been awarded by the Bureau of Yards and Docks, Navy Department, Washington, D. C., to Thomas Reilly, Seventh and Sedgely Streets, for the construction of the proposed power house and two transformer stations at the League Island Navy Yard, to cost about $129,986.

SHAMOKIN, PA.—The school directors have decided to install an electric plant for lighting the high school, at a cost of about $2,000.

SHARON, PA.—Work has been resumed by the Shenango Valley Electric Light Company on the installation of the new ornamental lighting system.

BALTIMORE, MD.—Preparations are being made by the City Council to begin work at once on the installation of new electric conduits, wires, etc., in Hollins Street, Hollins Market and Carrollton Avenue.

INDIAN HEAD, MD.—The War Department, Washington, D. C., is contemplating the construction of a plant to manufacture nitrates for naval explosives at Indian Head, for which an appropriation of $9,150 000 will be made.

FREDERICKSBURG, VA.—Plans are being considered for the installation of a power plant and laundry at the State Normal School.

PEARISBURG, VA.—The Giles Power Company, recently incorporated with a capital stock of $50,000, proposes to construct an electric plant to cost about $30,000. The plans provide for the erection of an electric transmission line to connect Pearisburg, Narrows and Glenlyn, a distance of 15 miles. All equipment, it is understood, has been purchased. Bernard Mason is president, and I. C. Hale secretary and manager.

RICHMOND, VA.—Swift & Company, it is reported, are contemplating the construction of an addition to their local cold-storage plant, to cost about $22,500.

WASHINGTON, D. C.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until June 10, under specification 3028, for furnishing cranes for aero storehouses. For further information address the chief of bureau.

WASHINGTON, D. C.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until June 10 for mechanical equipment, except lighting fixtures, for the United States immigration station at Boston, Mass. Drawings and specifications may be obtained at the above office or from the supervising chief engineer, room 137, Post Office Building, Boston.

WASHINGTON, D. C.—Contracts have been awarded by the War Department for the establishment of two picric acid plants, one to be located at Brunswick, Ga., and the other at Little Rock, Ark., to cost about $7,000,000 and $4,000,000 respectively. The contract for the Brunswick plant has been awarded to the Butterworth Judson Company of New York, N. Y., and the Little Rock plant to the Everly M. Davis Chemical Corporation.

WASHINGTON, D. C.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until June 14 for furnishing and installing lighting fixtures in the United States post offices at Bad Axe, Mich.; Basin, Wyo.; Chapel Hill, N. C.; Farmville, Va.; Forsyth, Ga.; Glasgow, Ky.; Hollidaysburg, Pa.; Kendallville, Ind.; Raton, N. M.; Rogers, Ark.; St. Peter, Minn.; Twin Falls, Idaho; Valparaiso, Ind.; Washington, Ga.; the new post office at Portland, Ore.; the post office and court house at Jasper, Ala., and Las Cruces, N. M., and the United States post office and custom house at Beaufort, S. C., and Newport, R. I. For details see Searchlight Department.

North Central States

APPLEGATE, MICH.—The City Council has purchased equipment for a municipal electric-light plant, which will be placed in the building of Garbutt Brothers.

DETROIT, MICH.—The Detroit United Railways Company will soon begin work on the construction of an extension to the Ford submarine chaser plant in Springwells.

DETROIT, MICH.—The water power of the River Rouge, where the great industrial projects, consisting of a large blast furnace, shipbuilding and tractor plant of Henry Ford, are being erected, it is announced, will be utilized to generate electricity.

HASTINGS, MICH.—Plans are being prepared by the Consolidated Press Company for the erection of a foundry and storage building, 130 ft. by 220 ft., a pattern building, 75 ft. by 150 ft., and a small forge shop. Frank Chase, Inc., industrial engineer, Chicago, Ill., has charge of the engineering and construction work.

HOMER, MICH.—The Homer Electric Light & Power Company is contemplating extensions to its plant.

KALAMAZOO, MICH.—The City Utilities Commission is considering remodeling the downtown ornamental lighting system. It is proposed to remove the arms from the lamp standards and place a single high-candle-power lamp on each post.

TEKONSHA, MICH.—The local electric-light plant was recently damaged by fire, causing a loss of about $5,000.

AKRON, OHIO.—The Northern Ohio Traction & Light Company, it is reported, will soon begin work on the construction of an extension to its Belden Avenue line. The cost of the work is estimated at about $50,000.

CANTON, OHIO.—The Canton Gas & Electric Company has petitioned the State Utilities Commission for permission to erect a high-tension transmission line along the right of way of the Chicago, Burlington & Quincy Railroad Company.

CINCINNATI, OHIO.—The Superior Electric & Manufacturing Company, manufacturer of electric generators and motors, has removed its plant from 610 Baymiller Street to a building at 118 West Third Street, where its present plant will be increased. Only a small amount of new equipment, it is understood, will be required.

CLEVELAND, OHIO.—Plans are being considered by the Wellman-Seaver-Morgan Company for the erection of a new power house, to cost about $30,000. The proposed building will be 46 ft. by 97 ft., and will be equipped with steam-heating apparatus, electric-lighting, steam and power equipment.

CROOKSVILLE, OHIO.—The Central Power Company is extending its electric transmission line from Crooksville south to Bearfield Township, where a new plant will supply power for the Jones Coal Company. A branch line is also being erected to the mines of the New York Coal Company at Rose Farm.

NORWOOD, OHIO.—Bids will be received at the office of the auditor of the city of Norwood, corner of Elm and Montgomery Avenues, Norwood, until June 17 for $15,000 in waterworks and electric light plant extension bonds, to provide funds for extensions and improvements to the waterworks and electric-light plant. W. R. Suhr is auditor.

CONNERSVILLE, IND.—The Rex Manufacturing Company, it is reported, has placed contracts for the installation of an electric plant of about 600 hp.

RICHMOND, IND.—The Board of Public Works has asked the City Council to appropriate $55,000 for extensions and improvements to the municipal electric-light plant. The proposed improvements will include the construction of a dam and screen and the purchase of a new boiler.

TERRE HAUTE, IND.—The Buettner & Shelburne Machine Company is erecting an addition, 47 ft. by 197 ft., to its plant, which will be used for the construction of electrical equipment for mining machinery. A number of lathes, drill presses and other machine tools will be required. Arthur Shelburne is general manager.

DEPERE, WIS.—The DePere Manufacturing Company has revised plans for extensions to its boiler and structural shops, formerly the Lyons Boiler Works, and will increase the size of the addition to the boiler shop from 60 ft. by 100 ft. to 100 ft. square; the addition to the machine shop will be 32 ft. by 200, and the smithy 24 ft. by 40 ft. The foundry will be converted into a structural shop. Ward Clark is general superintendent.

MARSHFIELD, WIS.—The Council is considering a proposal submitted by the Wisconsin Valley Electric Company of Wausau for either leasing or purchasing the local electric-light plant.

MILTON JUNCTION, WIS.—An election will soon be called to submit the proposal to purchase the local electric-light plant to be owned and operated by the municipality. The purchase of the water-works system is also under consideration.

TURTLE LAKE, WIS.—W. L. Alban, architect, Endicott Building, St. Paul, has been engaged by the Board of Education to prepare plans for a new high school building, with manual training and domestic science departments, to cost about $50,000.

CALEDONIA, MINN.—The right of way for an electric railway between Caledonia and Houston is reported to have been purchased. The officers of the Preston (Minn.) Light & Power Company, it is stated, are interested in the project.

ST. PAUL, MINN.—Plans are being prepared by Lambert Bassindale, architect, Capital Bank Building, St. Paul, for a hospital building and power plant for the Northern Pacific Mutual Beneficial Association in St. Paul, to cost about $300,000. H. B. Smith, 203 Railroad Building, is president of the association.

DAVENPORT, IOWA.—The Muscatine Lighting Company has been granted a franchise to erect an electric transmission line in Cleona Township to supply energy to the Farmers' Electric Light Company.

NEOLA, IOWA.—Improvements are contemplated to the local municipal electric-light and power plant, involving an expenditure of about $16,000.

ARCHIE, MO.—The Green Light & Power Company of Pleasant Hill is reported to be considering extending its electric transmission lines to furnish electricity in Archie.

MAYSVILLE, MO.—Improvements to the local electric-light plant, it is reported, are under consideration.

MARMARTH, N. D.—The local electric-light plant was recently destroyed by fire.

POLLOCK, S. D.—The installation of an electric-lighting plant in Pollock is under consideration. The Council is considering a proposal submitted by the Dakota Electric Company, which is planning to install a plant for its own use, to erect a larger plant and furnish electrical service in the town.

Southern States

HENDERSON, N. C.—The Henderson Box & Lumber Company would like to receive prices on the following electric equipment: One 150-hp. engine, one 150-hp. boiler and a 150-kw. generator, directly connected, switchboard and instruments.

CALHOUN, GA.—The Georgia Railway & Power Company has completed a new 66,000-volt substation in Calhoun and has also installed a 2000-kva. synchronous condenser at the Lindale substation.

MACON, GA.—The Chamber of Commerce has appealed to the City Council to have the ornamental lighting system extended from Broadway to the Terminal Station.

METTER, GA.—The City Council has recently purchased another crude-oil engine for the municipal electric-light plant.

CUTLER, FLA.—Contract has been awarded by the War Department, Washington, D. C., to the St. Johns Construction Company of Miami, for the erection of thirty buildings for the aero gunnery school for Signal Corps, including officers' quarters, barracks, mess halls and four steel hangars. The cost is estimated at $300,000.

FLORIDA CITY, FLA.—The installation of an electric-lighting plant in Florida City is reported to be under consideration by De Berry Brothers.

ST. AUGUSTINE, FLA.—Work will soon begin on the construction of the Flagler Hospital under the supervision of Charles Leyvrez of St. Augustine. The building will be equipped with electric elevators, silent call system, etc.

SARASOTA, FLA.—The City Council has engaged W. H. Ginn, engineer, Sanford, to appraise the local electric plant, make surveys and prepare plans for improvements. The city is considering the construction of an electric plant to supply electricity for municipal and domestic purposes and to operate the waterworks; also to extend the water and sewer systems.

JENIFER, ALA.—Improvements are contemplated by the Central Alabama Coal & Iron Company to its local plant, including the erection of an additional hot blast stove, installation of complete electrical equipment, machine shop, etc.; the construction of additional washer at brown-ore mines adjoining furnace, adding 50 coke ovens to present battery of 100 at coal mine. The plant is operated by the Thomas Furnace Company.

LITTLE ROCK, ARK.—The Mutual Motors Company, Southern Trust Building, is planning to equip a plant for rebuilding motors. Shop equipment, including lathes, drill presses, battery-charging outfit, air compressor, small shop tools, etc., will be required. The cost is estimated at $50,000.

VILLE PLATTE, LA.—Bids will be received by the city until June 4 for extensions to the municipal electric-lighting plant, including a 35-kw. alternator, building and line extensions, motor-driven pump, switchboard and transformer, moving and repairing one engine and General Electric generator. Specifications are on file at the office of A. C. Jones, Opelousas, La.

Pacific and Mountain States

LOON LAKE, WASH.—Plans have been prepared for the construction of a 100-ton concentration mill at the plant of the Loon Lake Copper Company, to cost about $40,000. The plans provide for the installation of considerable electrical machinery.

SEATTLE, WASH.—The plant of the Vulcan Manufacturing Company has been purchased by the Frank Waterhouse Company, which proposes to expend several hundred thousand dollars to enlarge the property. Main engine castings, heavy overhead traveling cranes, cargo winches, shaftings, etc., are manufactured in the plant.

CORNING, CAL.—The Northern California Power Company of San Francisco has submitted a proposal to the Board of Trustees for the installation of an electric-lighting system in Corning.

KINGMAN, ARIZ.—Preparations are being made by the Schuylkill Mining Company for the installation of a power plant to furnish power for its proposed 200-ton milling plant, now under construction.

PHOENIX, ARIZ.—Plans have been prepared by the Board of Managers of the State Hospital for the Insane for the construction of a power plant at the institution.

YUMA, ARIZ.—Plans are being considered by the Imperial Oil Mills Company for the erection of new electric light and power lines on the highways of Yuma Valley.

Canada

NEW WESTMINSTER, B. C.—Improvements and extensions involving an expenditure of about $5,000 are contemplated to the municipal electric-light plant.

BARRINGTON, N. S.—The installation of an electric-light plant, to cost about $8,000, in Barrington, is under consideration.

THEDFORD, ONT.—The Town Council is considering the installation of an electric-light and power system in Thedford.

Miscellaneous

HILO, HAWAII.—Plans are being prepared for the construction of a hydroelectric plant in the Kohala district on the property of Dr. Bond. The proposed plant will cost about $20,000 and will supply electricity to the new girls' seminary and also to residents and factories in that district.

PANAMA.—Bids will be received at the office of the general purchasing officer, Panama Canal, Washington, D. C., until June 14 for furnishing the following supplies: Motor-generator sets, capstans, radiators, motor-driven pumps, motor trucks, etc. Further information may be obtained at the above office.

Directory of Electrical Associations

Printed in the First Issue of Each Month

ALABAMA LIGHT AND TRACTION ASSOCIATION. Secretary-treasurer, J. P. Ross, Birmingham Railway, Light & Power Co.

AMERICAN ASSOCIATION OF ENGINEERS. Secretary, A. H. Krom, 29 South La Salle St., Chicago.

AMERICAN ELECTRIC RAILWAY ASSOCIATION. Secretary, E. B. Burritt, 8 West Fortieth St., New York. Annual meeting, Atlantic City, Oct. 8 and 9.

AMERICAN ELECTROCHEMICAL SOCIETY. Secretary, Prof. J. W. Richards, Lehigh University, South Bethlehem, Pa.

AMERICAN INSTITUTE OF CONSULTING ENGINEERS, INC. Secretary, F. A. Molitor, 35 Nassau St., New York City.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Secretary, F. L. Hutchinson, 33 West 39th St., New York. Board of directors meets monthly. Sections and branches in the principal electrical centers throughout the country.

AMERICAN PHYSICAL SOCIETY. Secretary, Prof. A. D. Cole, Ohio State University, Columbus, Ohio.

AMERICAN SOCIETY FOR TESTING MATERIALS. Secretary-treasurer, Edgar Marburg, University of Pennsylvania, Philadelphia.

ARKANSAS ASSOCIATION OF PUBLIC UTILITY OPERATORS. Secretary-treasurer, W. J. Tharp, Little Rock, Ark.

ASSOCIATED MANUFACTURERS OF ELECTRICAL SUPPLIES. General secretary, C. E. Dustin, 30 East 42d St., New York.

ASSOCIATION OF EDISON ILLUMINATING COMPANIES. Secretary, George C. Holberton, San Francisco, Cal.

ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS. Secretary, John F. Kelly, McKeesport, Pa. Annual convention, September, 1918.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS. Secretary-treasurer, Joseph A. Andreucetti, Chicago & North Western Railway, Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS. Secretary, W. L. Connelly, Gibson, Ind.

BRITISH COLUMBIA ASSOCIATION OF ELECTRICAL CONTRACTORS AND DEALERS. Secretary, R. B. W. Pirie, 406 Yorkshire Building, Vancouver, B. C. Annual meeting, September, 1918.

CALIFORNIA ASSOCIATION OF CONTRACTORS AND DEALERS. Secretary, A. H. Halloran, San Francisco, Cal.

CANADIAN ELECTRICAL ASSOCIATION, affiliated with N. E. L. A. Secretary-treasurer, M. C. Gilman. Toronto Electric Light Company. Annual meeting, Ottawa, Can., June 21.

COLORADO ELECTRIC LIGHT, POWER AND RAILWAY ASSOCIATION. Secretary-treasurer, T. F. Kennedy, 900 15th St., Denver, Col.

COMMERCIAL SECTION, N. E. L. A. Secretary, F. D. Beardslee, Union Electric Light & Power Co., St. Louis, Mo.

CONNECTICUT ELECTRICAL CONTRACTORS AND DEALERS' ASSOCIATION. Secretary, George M. Chapman, Waterbury, Conn.

EASTERN NEW YORK SECTION, N. E. L. A. Assistant secretary, J. L. Hemphill, General Electric Co., Schenectady, N. Y.

ELECTRICAL MANUFACTURERS' CLUB. Secretary, Shiras Morris, Hart & Hegeman, Hartford, Conn.

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION. General secretary, Franklin Overbagh, 411 South Clinton St., Chicago, Ill. Meeting, Cleveland, November.

ELECTRICAL TRADES ASSOCIATION OF CANADA. Secretary, William R. Stavely, Royal Insurance Building, Montreal, Can.

ELECTRICAL CREDIT ASSOCIATION OF THE PACIFIC COAST. Secretary, Albert E. Elliott, 502 Flatiron Building, San Francisco.

ELECTRIC POWER CLUB. Secretary, C. H. Roth, 1410 West Adams St., Chicago. Meeting, Hot Springs, Va., May 30, 31, June 1.

ELECTRIC VEHICLE SECTION OF THE N. E. L. A. Secretary, A. Jackson Marshall, 29 West 39th St., New York.

EMPIRE STATE GAS AND ELECTRIC ASSOCIATION. Secretary, Charles H. B. Chapin, 29 West 39th St., New York.

FLORIDA ENGINEERING SOCIETY. Secretary, J. R. Benton, Gainesville, Fla.

GEORGIA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, Dan Carey, Atlanta Builders' Exchange, Atlanta, Ga. Annual meeting, June, 1918, Tybee Island, Ga.

ILLINOIS ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, L. B. Van Nuys, Central Electric Co., Peoria, Ill.

ILLINOIS STATE ELECTRIC ASSOCIATION. Secretary, R. H. Abbott, Petersburgh, Ill.

ILLUMINATING ENGINEERING SOCIETY. General secretary, Clarence L. Law. Sections in New York, Philadelphia, Pittsburgh, Cleveland, Chicago and Boston.

INDIANA ELECTRIC LIGHT ASSOCIATION. Secretary, Thomas Donahue, Lafayette, Ind.

INDIANA STATE ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, George Skillman, Indianapolis, Ind.

INDUSTRIAL ELECTRIC HEATING ASSOCIATION. Secretary, Homer Kunz, Toledo Railways & Light Co., Toledo, Ohio.

INSTITUTE OF RADIO ENGINEERS. Secretary, David Sarnoff, City College of New York.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS. Secretary, C. R. George, Houston, Tex. Annual convention, Atlanta, Ga., Sept. 24-27.

OKLAHOMA GAS, ELECTRIC AND STREET RAILWAY ASSOCIATION. Secretary, L. W. W. Morrow, Norman, Okla.

INTERNATIONAL ELECTROTECHNICAL COMMISSION (international body representing various national electrical engineering societies contributing to its support). General secretary, C. le Maistre. 28 Victoria St., Westminster, London, S. W., England.

IOWA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, M. T. Humphrey, Waterloo, Iowa.

IOWA SECTION, N. E. L. A. Secretary-treasurer, L. E. Caldwell, Iowa City, Iowa.

JOVIAN ORDER. Jupiter (president), Henry J. F. Strickland, Dallas, Tex.; Mercury (secretary), E. C. Bennett, Syndicate Trust Building, St. Louis, Mo.

KANSAS ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, R. M. Sutton, Wichita.

KANSAS PUBLIC SERVICE ASSOCIATION. Secretary-treasurer, W. W. Austin, Cottonwood Falls, Kan. Annual meeting, Kansas City, Kan., Oct. 17-19, 1918.

KENTUCKY ASSOCIATION OF ELECTRICAL CONTRACTORS. Secretary, F. F. Valinoti. Annual meeting, May, 1918, Louisville, Ky.

LOUISIANA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, I. G. Marks, 323 Chartres St., New Orleans, La.

MAINE ELECTRIC ASSOCIATION. Secretary-treasurer, Walter S. Wyman, Augusta, Me.

MASSACHUSETTS ELECTRICAL CONTRACTORS AND DEALERS' ASSOCIATION. Secretary, J. E. Wilson, 263 Summer St., Boston, Mass.

MICHIGAN SECTION, N. E. L. A. Secretary, Herbert Silvester, Detroit Edison Co., Monroe, Mich.

MINNESOTA ELECTRICAL ASSOCIATION. Secretary, H. E. Young, Minneapolis General Electric Company, Minneapolis, Minn.

MINNESOTA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, G. M. Jones, 112 South Seventh St., Minneapolis, Minn.

MISSISSIPPI ELECTRIC ASSOCIATION. Affiliated with the N. E. L. A. Secretary-treasurer, W. F. Wheeler, Hattiesburg.

MISSOURI ASSOCIATION OF PUBLIC UTILITIES. Secretary-treasurer, F. D. Beardslee, Union Electric Light & Power Co., St. Louis.

MISSOURI ELECTRICAL CONTRACTORS AND DEALERS' ASSOCIATION. Secretary, A. J. Burns, 318 West Tenth St., Kansas City, Mo.

NATIONAL ARM, PIN AND BRACKET ASSOCIATION. Secretary, J. B. Magers, Madison, Ind.

NATIONAL ASSOCIATION OF ELECTRICAL CONTRACTORS AND DEALERS. Secretary, H. C. Brown, 110 West 40th St., New York.

NATIONAL ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary-treasurer, William L. Smith, Concord, Mass.

NATIONAL ELECTRIC LIGHT ASSOCIATION. Executive secretary, T. C. Martin, 33 West 39th St., New York. Convention, Atlantic City, N. J., June 13 and 14.

NATIONAL ELECTRICAL CREDIT ASSOCIATION. Secretary, Frederic P. Vose, 1350 Marquette Building, Chicago, Ill. Annual meeting, Chicago, June 17 and 18.

NATIONAL FIRE PROTECTION ASSOCIATION. Secretary of electrical committee, Ralph Sweetland, 141 Milk St., Boston, Mass.

NEBRASKA SECTION, N. E. L. A. Secretary-treasurer, R. W. McGinnis, O'Neil Light & Creamery Co., O'Neil, Neb.

NEW ENGLAND ELECTRICAL CREDIT ASSOCIATION. Secretary, Alton F. Tupper, 15 State St., Boston, Mass.

NEW ENGLAND SECTION, N. E. L. A. Secretary, Miss O. A. Bursiel, 149 Tremont St., Boston, Mass.

NEW MEXICO ELECTRICAL ASSOCIATION. Secretary-treasurer, E. A. Thiele, Roswell.

NEW YORK ELECTRICAL CREDIT ASSOCIATION. Secretary, Franz Neilson, 120 Broadway, New York. Annual meeting, June, 1918.

NEW YORK ELECTRICAL SOCIETY. Secretary, George H. Guy, 29 West 39th St., New York.

NORTHWEST ELECTRIC LIGHT AND POWER ASSOCIATION. Affiliated with N. E. L. A. Secretary, George L. Myers, Pacific Power & Light Co., Portland, Ore. Annual meeting, Sept. 11, 1918.

NORTHERN WHITE CEDAR ASSOCIATION. Secretary, N. E. Boucher, 743 Lumber Exchange, Minneapolis, Minn.

OHIO ELECTRIC LIGHT ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio. Convention, Cedar Point, Ohio, July 10, 11, 12.

OHIO SOCIETY OF MECHANICAL, ELECTRICAL AND STEAM ENGINEERS. Secretary, Prof. F. E. Sanborn, Ohio State University, Columbus.

OREGON ASSOCIATION OF ELECTRICAL CONTRACTORS AND DEALERS. Secretary-treasurer, J. W. Oberender, 302 Dekun Building, Portland, Ore. Annual meeting, September, 1918.

PACIFIC COAST SECTION, N. E. L. A. Secretary, A. H. Halloran, Crossley Building, San Francisco, Cal.

PENNSYLVANIA ELECTRIC ASSOCIATION. State Section N. E. L. A. Secretary, H. M. Stine, 211 Locust St., Harrisburg, Pa.

PENNSYLVANIA ELECTRICAL CONTRACTORS AND DEALERS' ASSOCIATION. Secretary, M. G. Sellers, 1518 Sansom St., Philadelphia.

PUBLIC SERVICE ASSOCIATION OF VIRGINIA. Secretary, W. J. Kelly, Virginia Railway & Power Co., Richmond, Va.

PUBLIC UTILITIES ASSOCIATION OF WEST VIRGINIA. Secretary, W. C. Davisson, West Virginia Water & Electric Co., Charleston.

RADIO CLUB OF AMERICA. Secretary, T. J. Styles, 152 Beach St., Yonkers, N. Y.

ROCKY MOUNTAIN ASSOCIATION OF MUNICIPAL ELECTRICIANS. President, Lawrence Stone, Denver, Col.

SOCIETY FOR ELECTRICAL DEVELOPMENT, INC. General manager, J. M. Wakeman, 29 West 39th St., New York.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. Secretary, Dean F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa. Annual meeting, Evanston, Ill., June, 1918.

SOUTH DAKOTA ELECTRICAL POWER ASSOCIATION. Secretary-treasurer, O. J. Gronsdahl, Hartford, S. D.

SOUTHEASTERN SECTION, N. E. L. A. Secretary-treasurer, T. W. Peters, Columbus, Ga. Annual meeting, June 19-20, Atlanta.

SOUTHERN CALIFORNIA ELECTRICAL CONTRACTORS AND DEALERS' ASSOCIATION. Secretary-treasurer, J. E. Wilson, 425 Consolidated Realty Building, Los Angeles, Cal.

SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Secretary, H. S. Cooper, 403-4 Slaughter Building, Dallas, Tex.

SOUTHWESTERN SOCIETY OF ENGINEERS. Secretary, C. E. Barglebaugh, 703 First National Bank Building, El Paso, Tex.

TEXAS STATE ASSOCIATION OF ELECTRICAL CONTRACTORS. Secretary, H. S. Ashley, Fort Worth, Tex. Annual meeting, Galveston, Tex., June 15, 1918.

TORONTO ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, J. E. Myers, 3 Gould St., Toronto, Ont.

TRI-STATE WATER AND LIGHT ASSOCIATION. Secretary-treasurer, W. F. Steiglitz, Columbia, S. C.

VERMONT ELECTRICAL ASSOCIATION. Secretary-treasurer, C. H. West, Rutland, Va.

VIRGINIA STATE ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, E. M. Andrews, Richmond.

WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary, W. S. Boyd, 175 W. Jackson Blvd., Chicago.

WESTERN SOCIETY OF ENGINEERS, ELECTRICAL SECTION. Secretary, E. S. Nethercut, 1735 Monadnock Block, Chicago.

WISCONSIN ELECTRICAL ASSOCIATION. Secretary, J. P. Pulliam, Green Bay, Wis.

WISCONSIN ELECTRICAL CONTRACTORS AND DEALERS' ASSOCIATION. Secretary, J. C. Staff, 578 Jackson St., Milwaukee, Wis.

Record of Electrical Patents

Notes on United States Patents

(Issued April 30, 1918.)

1,264,826. Automatic Telephone Exchange; Frank A. Lundquist, New York, N. Y. App. filed July 10, 1916. Improvements in the construction and operation.

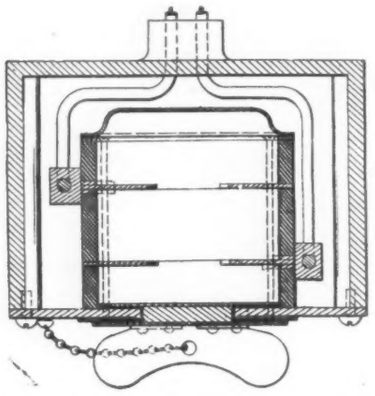
1,264,933. Binding Post; Fritz P. Mansbendel, Brooklyn, N. Y. App. filed May 10, 1916. Holds a conductor of any cross-section.

1,264,868. Protective Device for Electric Utensils; Frederick E. Carlson, New Britain, Conn. App. filed April 13, 1917. Means for breaking the circuit in case the utensil becomes overheated.

1,264,872. Spark-Plug Tester; Bernard A. Narveson, Grand Rapids, Minn. App. filed Dec. 26, 1916. Improvements.

(Issued May 7, 1918.)

1,264,889. Telegraphy; William M. Bruce, Jr., Springfield, Ohio. App. filed April 27, 1916. For sending uniform electrical impulses of opposite polarity at the beginning and the end of a character.



1,265,163—Plug and Plug Receptacle for Electric Conductors

1,264,898. Electric Switch; Frank D. Clapper, Altus, Okla. App. filed Feb. 21, 1916. A combination switch for controlling one or more electrical circuits dependently or collectively.

1,264,931. Magneto; Otto Heins, New York, and Charles M. Wild, Springfield, Mass. App. filed Dec. 27, 1915. A bipolar armature co-operates with a four-pole field member to produce four ignition voltages per rotation.

1,264,933. Timer; Frederick C. Hersee, Boston, Mass. App. filed April 19, 1917. Circuit closer used for controlling the flow-off current to the various igniters of a multiple-cylinder internal-combustion engine.

1,264,941. Control of Electric Motors and Apparatus Therefor; Pearl N. Jones, Pittsburgh, and James W. Welsh, Oakmont, Pa. App. filed July 17, 1915. Improvement.

1,264,943. System of Selective Electrical Distribution; Charles F. Kettering and William A. Chryst, Dayton, Ohio. App. filed Nov. 20, 1912. Used with internal-combustion engines.

1,264,949. Method of Production of Cyanogen Compounds; Axel R. Lindblad, Ludyika, Sweden. App. filed June 1, 1916. Improvements.

1,264,974. Vulcanizer; Joseph H. Reeder, St. Louis, Mo. App. filed Sept. 7, 1917. Electric vulcanizer adapted to receive its heat from low-tension currents.

1,264,982. Means and Method for Metering Electricity; Edmund O. Schweitzer, Chicago, Ill. App. filed Aug. 18, 1915. Inexpensive method and apparatus for accurately metering the consumption of electricity, and more particularly means for affording a satisfactory basis for payment to the central-station company by the consumer for electrical energy furnished to and consumed by him.

1,264,992. Motor Control; Walter C. Strang, Yonkers, N. Y. App. filed Aug. 22, 1913. Automatically operated means for preventing the too sudden reversal of the motor.

1,265,000. Electrical System of Distribution; William A. Turbayne, Niagara Falls, N. Y. App. filed Feb. 15, 1913. A regulating generator or booster is employed to control the division of load between the main source and the auxiliary source.

1,265,017. Push-Button Switch; James M. Wilson, Newark, N. J. App. filed April 1, 1915. For out-door use.

1,265,026. Hood Lock; James W. Alexander, Pittsburgh, Pa. App. filed June 14, 1917. For automobiles.

1,265,068. Method and Apparatus for Producing Alternating Currents; Reginald A. Fessenden, Brookline, Mass. App. filed Dec. 2, 1914. Production of a wave form adapted for special purposes.

1,265,071. Indicator for Street Cars and the Like; Charles Flint, Spokane, Wash. App. filed April 26, 1916. Operated by either the motorman or conductor of the car to indicate to the passengers thereof the various stations along the route.

1,265,163. Plug and Plug Receptacle for Electric Conductors; Otto Bahls and Theodore Siebert, Jr., New York, N. Y. App. filed Oct. 28, 1916. Reliable in action and thoroughly protected against accidental short circuits during insertion or removal of the plug.

1,265,184. Method of Controlling Electrical Power Transmission; Herbert B. Ewbank, Jr., Portland, Ore. App. filed May 1, 1916. Improvements.

1,265,192. Priming Heater for Automobiles; Robert C. Groh and Martin A. Hansen, St. Paul, Minn. App. filed Jan. 4, 1915. Improvements.

1,265,197. Electromechanical Traffic Signal; Henry W. Hawes, Lynn, Mass. App. filed March 2, 1917. Especially designed for use on automobiles, motor trucks and motor vehicles in general.

1,265,204. Metallic-Filament Lamp and Process of Making It; Herman J. Jaeger, Weehawken, N. J. App. filed July 27, 1917. Improvements.

1,265,213. Electric Water Heater; Otto A. Knopp, Oakland, Cal. App. filed June 7, 1916. Thermostatic electric water heater of cheap and rugged construction.

1,265,223. Electric Fuse; Israel Marcus, Winthrop, Mass. App. filed Nov. 27, 1916. A simply constructed fuse having a sight opening in one wall of the casing thereof through which it can be determined whether or not the fuse wire therein is broken.

1,265,225. Semi-Automatic Telephone System; Talbot G. Martin, Chicago, Ill. App. filed March 3, 1911. Means are provided for automatically indicating to the operator the character of the line calling.

1,265,228. Telephone Exchange Trunking System; Edward A. Mellinger, Chicago, Ill. App. filed Oct. 11, 1910. Automatic switches are employed for selecting trunks or other lines.

1,265,247. Maximum Demand Instrument; George D. Pogue, St. Louis, Mo. App. filed May 12, 1916. For determining the maximum average demand made by a consumer during an interval of prescribed length occurring at any time during a fiscal period.

1,265,284. Separator for Storage Batteries; Ira C. Williams and Charles F. Williams, Muncie, Ind. App. filed Feb. 21, 1917. Means for separating the negative and positive plates from each other.

1,265,293. Electric Service Box; Carl H. Bissell and Harold P. Hastings, Syracuse, N. Y. App. filed Jan. 25, 1913. Especially applicable for housing the terminals, switches, fuses, etc., in branch circuits leading from the main circuit into a building or factory.

1,265,294. Electrical Appliance; Carl H. Bissell and Elda G. Smith, Syracuse, N. Y. App. filed Aug. 7, 1914. Adapted for storage-battery-charging stations in railroad terminals and coach yards.

1,265,342. Electric Arc Welding; Otis A. Kenyon, New York, N. Y. App. filed March 14, 1918. Improvements.

1,265,360. Process for Producing Alkali Metals or the Like; Walter L. Morrison, Canonsburg, Pa. App. filed Aug. 17, 1916. Improvements.

1,265,361. Burglar Alarm; Emil Muringer, New York, N. Y. App. filed May 29, 1916. Improvements.

1,265,398. Automatic Telephone Central-Station Apparatus; Alton E. Stevens, Providence, R. I. App. filed April 28, 1917. Designed to allow faulty or broken parts to be easily removed and perfect ones substituted.

1,265,428. Electric Signaling Circuit-Closing Alarm; Ralph S. Clayton, Philadelphia, Pa. App. filed Jan. 28, 1915. Improvements.

1,265,433. Electric Heating Unit; Ransom W. Davenport, Detroit, Mich. App. filed Jan. 24, 1916. Improvements.

1,265,453. Metal Electrode Used in Electric-Arc Deposition of Metals; Ernest H. Jones, Canonbury, London, England. App. filed Sept. 29, 1917. Improvements.

1,265,454. Ignition System; Charles F. Kettering and William A. Chryst, Dayton, Ohio. App. filed April 3, 1916. Combined with combustion or explosion engines.

1,265,455. Electric Fitting; George C. Knauff, Chicago, Ill. App. filed Dec. 9, 1915. Provides an electric fitting in which one of the wire terminals may be easily and cheaply connected to a conducting shell portion, and in which the juncture of the wire with the shell portion may be readily concealed.

1,265,472. Combined Burglar or Fire Alarm; Carey T. Matthews, Kennebec, N. C. App. filed July 14, 1916. Uses a plurality of signal devices having different signaling characteristics so as to distinguish, for example, between a fire alarm and a burglar alarm.

1,265,485. Electrical Furnace; Hans Nathusius, Friedenshuette, Kreis Beuthen, Germany. App. filed Oct. 5, 1914. Designed for carrying out metallurgical processes for obtaining zinc.

1,265,513. Dashboard Lamp Socket; Edward S. Preston, Chicago, Ill. App. filed May 23, 1917. Improvements.

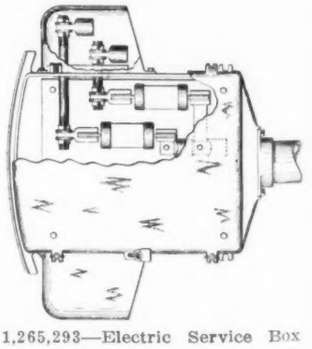
1,265,517. Incandescent Lamp Socket; Jacob Ribaysen, Chicago, Ill. App. filed June 15, 1916. Improvements.

1,265,551. Electrolytic Apparatus; Charles H. Thomson, Maryville, Tenn. App. filed April 7, 1917. For the separation of aluminum and other metals from ores by electrolytic action in a fused bath.

1,265,554. Electric Water Heater; Salvadore M. Valdes, San Antonio, Tex. App. filed Nov. 28, 1916. A device within a metallic shell or casing which does not come into electrical connection with the live wire of the circuit.

1,265,576. Electric Cut-Out; Gilbert Wright, Schenectady, N. Y. App. filed May 5, 1915. Excessive current flow is brought about by overheating of a fusible member or body in consequence of such flow.

1,265,589. Telegraph Sounder; Arthur W. Beauprie, Atlanta, Ga. App. filed Feb. 12, 1916. Capable of being operated by alternating current.



1,265,293—Electric Service Box

1,265,594. Dynamo-Electric Machine; Seven R. Bergman, Nahant, Mass. App. filed June 18, 1917. Armature reaction is neutralized and the exciting flux of the machine is produced by a single field winding whose magnetizing axle is displaced approximately 45 electrical degrees from the magnetizing axis of the armature winding.

1,265,613. Art of Arc Winding, Heating and the Like; Charles L. Coffin, Parks, Ga. App. filed April 5, 1916. So to utilize the heat of an electric arc to heat the material to be operated upon that an excessive rush of current is avoided, both at the commencement and throughout the heating operation.